

AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Ritchie, James, 1911. Scientific results of the trawling expedition of H.M.C.S. "Thetis," off the coast of New South Wales, in February and March, 1898, Hydrozoa (Hydroid Zoophytes and Stylasterina). *Australian Museum Memoir* 4(16): 807–869, plates lxxxiv–lxxxix. [30 November 1911].

doi:10.3853/j.0067-1967.4.1911.1512

ISSN 0067-1967

Published by the Australian Museum, Sydney

nature culture **discover**

Australian Museum science is freely accessible online at
www.australianmuseum.net.au/publications/
6 College Street, Sydney NSW 2010, Australia



HYDROZOA (HYDROID ZOOPHYTES
AND STYLASTERINA)

OF THE "THETIS" EXPEDITION.

BY JAMES RITCHIE, M.A., B.Sc., THE ROYAL SCOTTISH
MUSEUM, EDINBURGH.

HYDROZOA (HYDROID ZOOPHYTES AND STYLASTERINA).

BY JAMES RITCHIE, M.A., B.Sc., THE ROYAL SCOTTISH
MUSEUM, EDINBURGH.

(Plates lxxxiv.-lxxxix., and fig. 126.)

Despite the fact that Hydroid Zoophytes were obtained by the "Thetis" at only eleven of the fifty-nine definite stations at which dredgings were made, the collection is one of great variety and of much interest. Most striking in a general survey of the collection, is the high percentage of forms the structures of which are markedly different from those of the species of any other region; for, in the total of thirty-eight species and varieties which the collection contains, fifteen have been found only in Australian seas.

On this account the main interest of the present Report lies in the additional information which it offers regarding the morphology of species of great rarity, and regarding the variations of structure to which these, and the more widely distributed forms here represented, are subject. The characters of several of the specimens are so distinct from those recorded that I have found it necessary to establish for them eight new species and varieties, distributed amongst the genera *Lictorella* (1 sp.), *Cryptolaria*, (1 sp. and 2 vars.), a genus not hitherto known from the Australian area, *Sertularella* (1 sp. and 1 var.), *Halicornaria* (1 sp.), and *Cladocarpus* (?) (1 sp.), also recorded for the first time from Australia. Of these the most interesting, from a general point of view, is the dimorphic variety of *Cryptolaria crassicaulis*, which throws light on the phylogenetic origin of *Cryptolaria*, and emphasises the close relationship that exists between that genus and *Lafoëa*. The gonosome of the widely distributed *Lafoëa serrata* has been described for the first time. The comparative rarity of Gymnoblasic forms and of minute epizoid species is noticeable.

As to the geographical significance of the collection:—Thirteen species and one variety, each indicated by an asterisk in the following list, have been added to the Hydroid fauna of Australian seas, one of which, *Cladocarpus bathyzonatus*, is particularly noteworthy in that it belongs to a well-marked section of the genus *Cladocarpus*, which has hitherto been regarded as confined to American waters. While it would be presumption to endeavour to deduce with minuteness the wider relationships of

the Hydroid fauna of South-east Australia, from a collection limited to about half the known species in that area, the general facts are clear. That, although an unusually large proportion of this fauna is peculiar to Australia, there are also many species common to it and other oceanic regions. These do not appear to bear out the statement of W. M. Bale¹ that "the Hydroida of the South-eastern province have more affinity with those of New Zealand than with these of any other part of the globe." For, of the twenty-two species concerned, thirteen have been found in the Indian Ocean, thirteen in the Atlantic, and ten in the Pacific, while only six occur in the neighbourhood of New Zealand. Miss L. R. Thornely has, however, justly drawn attention to the similarity which exists between the Hydroid fauna of Indian seas and that of Australia,² for it is probable the latter is more closely allied to the former than to any other.

As regards the local distribution:—The average number of species obtained at the productive Stations is slightly under five, the Stations at which larger numbers were obtained being 36 (8 spp.), 44 (13 spp.), 48 (9 spp.), 54 (9 spp.), 57 (6 spp.). Examination of the provenance of the specimens would lead one to suppose that the Hydroid fauna was most abundant in the coastal region which lies between Port Jackson and Bulgo (to the south of Port Hacking), but this supposition is discounted by the fact that it was precisely in this area that the collecting of the "Thetis" was most intense.

Besides the Hydroid Zoophytes proper, there has been included in this report *Stylaster eximius*, the only calcareous Hydrozoon received by me. It has not hitherto been recorded from Australia.

I cannot conclude this introduction to the description of a highly interesting Australian collection of Hydrozoa, without paying tributes to the unrivalled work accomplished for Australian Zoophytology by Mr. W. M. Bale in his admirable "Catalogue," published by the Trustees of the Australian Museum, supplemented by his later papers; and to the painstaking studies of Dr. Armand Billard, whose examinations of type specimens have done much to free the literature of Hydroids from mystifying synonyms.

Finally, I would express my thanks to the Trustees of the Australian Museum for entrusting to me, for examination, the collection brought together by the "Thetis."

18th January, 1911.

¹ Bale—Cat. Austr. Hydroid Zoophytes, Sydney, 1884, p. 32.

² Thornely—in Herdman, Rep. Ceylon Pearl Oyster Fisheries, Part ii., Suppl. Rep. viii.—Hydroida, p. 107.

LIST OF SPECIES.

Phylum **COELENTERATA.**Class **HYDROZOA.**Order **GYMNOBLASTEÆ.**Family **HYDRO CERATINID Æ.**

Clathrozoön wilsoni, Baldwin Spencer.

Family **EUDENDRID Æ.**

Eudendrium, sp. indet.

Order **CALYPTOBLASTEÆ.**Family **HALECID Æ.**

Halecium flexile, Allman (?).

**Halecium sessile*, Norman.

Family **CAMPANULARID Æ.**

**Campanularia hincksii*, Alder, var. *grandis*, Billard.

Campanularia tincta, Hincks (?).

**Clytia elongata*, Marktanner-Turneretscher.

Hebella calcarata (A. Agassiz).

Family **LAFOEID Æ.**

Lafoëa gracillima (Alder), forma *typica*.

**Lafoëa serrata*, Clarke.

**Lafoëa tenellula*, Allman.

Lictorella antipathes (Lamarck).

**Lictorella concinna*, sp. nov.

**Cryptolaria arboriformis*, sp. nov.

**Cryptolaria conferta*, Allman, var. *australis*, var. nov.

**Cryptolaria crassicaulis*, Allman, var. *dimorpha*, var. nov.

Perisiphonia exserta (Johnson).

Family SERTULARIDÆ.

- **Sertularella adpressa*, sp. nov.
Sertularella divaricata (Busk), var. *subdichotoma*, Bale.
Sertularella longithecata, Bale, *typica*.
 **Sertularella longithecata*, Bale, *robusta*, var. nov.
 **Sertularella turgida* (Trask), ?
Thuiaria sinuosa, Bale.
Sertularia elongata, Lamouroux.
Sertularia minima, Thompson.
Syntheceium cylindricum (Bale).
Syntheceium orthogonium (Busk).
Diphasia subcarinata (Busk).

Family PLUMULARIDÆ.

- Plumularia setacea* (Linnæus).
Plumularia sulcata, Lamarck.
Diplocheilus mirabilis, Allman.
Halicornopsis elegans (Lamarck).
Halicornaria furcata, Bale.
Halicornaria prolifera (Bale).
 **Halicornaria thetidis*, sp. nov.
 **Cladocarpus*(?) *bathyzonatus*, sp. nov.
Aglao phenia crucialis, Lamouroux.
Aglao phenia divaricata (Busk).

Order STYLASTERINA.

Family STYLASTERIDÆ.

- **Stylaster eximius*, Saville Kent.

Phylum COELENTERATA.

Class HYDROZOA.

Order GYMNOBLASTEÆ.

Family HYDRO CERATINIDÆ.

CLATHROZOOON WILSONI, Baldwin Spencer.

- Clathrozoön wilsoni*, Spencer, Trans. Roy. Soc. Vict., ii., 1, 1891,
 p. 123, pls. 17-20, figs. 1-16. *Id.*, Bale, Proc. Roy. Soc.
 Vict., (n.s.), vi., 1894, p. 96.

* Indicates that the species is here recorded for the first time from Australian seas.

The skeleton of a single dried colony is a little over one foot in height. It originally consisted of three almost equally developed branches, of which two remain. The stem is 18 mm. in diameter at the base. The habit of the colony resembles that of some of the Gorgonid Alcyonarians of the genus *Juncella*; but the growth is not so luxurious nor so sturdy as in the specimen figured by Spencer (Pl. 17, fig. 1), although the colony somewhat exceeds his in height. The diameter of the aperture of a hydrophore was found to vary from 0·12 to 0·18 mm.

Locality.—Off the coast of New South Wales.

The species has hitherto been found only in Bass Strait, near Port Phillip Heads, Victoria.

Family EUDENDRIDÆ.

EUDENDRIUM, *sp. indet.*

Station 36.

Poor specimens, without cœnosarc, and consisting of short stems from which a few branches with ringed bases arise, represent an indeterminable species of *Eudendrium*. It is probable that the specimens belong to the species *Eudendrium pusillum*, which von Lendenfeld³ recorded from Port Jackson, in the same neighbourhood in 1885, and which Miss Thornely has since described from the Gulf of Manaar.⁴

Locality.—Station 36, off Botany Bay, one mile from shore; depth, 23 to 20 fathoms; bottom, sand to rock; 11th March, 1898.

Order CALYPTOBLASTEÆ.

Family HALECIDÆ.

HALECIUM FLEXILE, *Allman* (?).

Halecium flexile, Allman, Rep. Sci. Results "Challenger" Exped., Zool., xxiii, Hydroida, pt. ii., 1888, p. 11, pl. xi., figs. 2, 2a. *Id.*, Hartlaub, Zool. Jahrb. Jena, Suppl. vi., iii., 1905, p. 611, figs. J³, K³. *Id.*, Billard, Ann. Sci. Nat. (n.s.), xi., 1910, p. 3.

³ Von Lendenfeld—Proc. Linn. Soc. N.S. Wales, ix., 1885, p. 352.

⁴ Thornely—in Herdman, Ceylon Pearl Oyster Fisheries, Part ii., Suppl. Rep., viii.—Hydroida, p. 110.

Halecium gracile, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 759, pl. xiv., figs. 1-3. *Id.*, Bale, Proc. Roy. Soc. Vict. (n.s.), vi., p. 99. *Id.*, Jäderholm, Ark. för Zool. Stockholm, i., 1903, p. 266, pl. 12, figs. 2, 3.

Halecium parvulum, Bale, Proc. Linn. Soc. N.S. Wales (2), iii., 1888, p. 760, pl. xiv., figs. 4, 5. Marktanner-Turneretscher, Ann. K.K. Hof-mus. Wien, v., 1890, p. 218, pl. iii., fig. 22-

Station 44.

To this species I refer, with some hesitation, a very fragmentary specimen, without gonosome. The stem is weakly fasciated at the base, and the hydrothecæ resemble those in the figure by Allman, rather than those in that by Bale, although rarely an example with much everted margin occurs. The hydrothecæ, however, lie more closely to the stem than do those in Allman's figure. The size of the hydrothecæ and their rapid widening from base to margin are notable.

Dimensions.—

Stem internode, length.....	0.61-0.77 mm.
" " diameter.....	0.19-0.24 "
Hydrotheca, depth	0.06-0.07 "
" diameter at mouth...	0.17-0.18 "
" " base ...	0.12-0.14 "

Locality.—Entangled amongst Polyzoa from Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898.

HALECIUM SESSILE, *Norman*.

(Plate lxxxvii., figs. 8, 9.)

Halecium sessile, Norman, Rep. Brit. Assoc. Adv. Sci. for 1866, p. 196. *Id.*, Hincks, Hist. Brit. Hydroid Zoophytes, 1868, p. 229, pl. xlv., fig. 2. *Id.*, Billard, Ann. Sci. Nat., Zool., (8), xx., 1904, p. 157, pl. iii., figs. 8 and 9, pl. vi. *Id.*, Jäderholm, Kungl. Svenska Vetens-Akad. Handl., xlv., 1909, p. 58.

?*Halecium robustum*, Vanhöffen, Deutsche Südpolar Exp., 1901-1903, xi., Zool. iii., p. 319, fig. 35.

Station 54.

A rare colony or two, apparently of this species, was found springing from a stolon creeping upon a sandy worm-tube. The colonies are very minute, the largest being only 6 mm. high, in this respect resembling the dwarf variety described by Billard from La Hougue, which also grew upon the tubes of Sabellid

worms (or on *Cystosira*). No gonothecæ are present to confirm the identification, but the minute characters of the unfascicled and usually simple trophosome agree with those of this species. There is great variation, however, in the dimensions of the internodes, the proportions varying so much that little account ought to be taken of the relation of length to breadth in distinguishing at least this species. The following table of dimensions, as well as the figures on Plate lxxxvii., illustrate the variation which occurs even in the very scanty material before me.

Dimensions.—

Internode, length	0·15, 0·27, 0·31, 0·57, 0·59 m.m.
„ diameter at base	0·14, 0·13, 0·14, 0·15, 0·14 „
Hydrotheca, diameter	0·14 mm.

Locality.—On Sabellid worm tubes from Station 54, within Jervis Bay; depth, 10 to 11 fathoms; bottom, seaweed and sand.

Halecium sessile, although widely distributed in the North Atlantic from Europe to the east coast of North America, and from Lofoten in Norway to south of Maderia, has not so far been recorded from without that area.

Family CAMPANULARIDÆ.

CAMPANULARIA HINCKSII, Alder,

var. GRANDIS, Billard.

Campanularia volubilis, var., Hincks, Ann. Mag. Nat. Hist. (2), xi., 1853, p. 180.

Campanularia hincksii, Alder, Ann. Mag. Nat. Hist. (2), xviii., 1856, p. 360, pl. xiii., fig. 9. *Id.*, Hincks, Hist. Brit. Hydroid Zoophytes, 1868, p. 162, fig. 18, pl. xxiv., figs. 3, 3a. *Id.*, Billard, Exp. Sci. "Travailleur" et "Talisman," Hydroides, viii., 1907, p. 172, fig. 4.

Campanularia hincksii, var. *grandis*, Billard, *Op. cit.*, p. 172, fig. 5.

Campanularia hincksi, Jäderholm, Kungl. Svenska Vetens.-Akad. Handl., xlv., 1909, p. 67, pl. vi., fig. 11.

Station 44.

The few specimens referred to this species differ somewhat from the typical forms of British seas. The main differences lie in the greater size of the Australian specimens; in the absence of longitudinal fluting on the walls of the hydrotheca; in the weakness or absence of the notch which in typical specimens

indents the square tops of the teeth; and in the shape of the hydrotheca, which, instead of forming a cylinder rounded at the base, resembles more an inverted cone, for the sides slope gradually from the mouth where the diameter is greatest to the point of junction with the stalk. In these respects, as well as in the less marked development of the diaphragm at the base of the hydrotheca, our specimens agree with var. *grandis*, obtained by the "Talisman" in the Gulf of Cadiz, and described by Billard, and to that variety we accordingly assign them.

Dimensions.—

Stalk, length	up to 3.5 mm.
„ diameter	0.057-0.096 mm.
Hydrotheca, depth.....	0.91-0.98 mm.
„ diameter at mouth ...	0.38-0.49 mm.

Remarks.—*Campanularia hincksii*, var. *grandis*, is a variety which approaches the Antarctic species, *Campanularia laevis*; originally described by Hartlaub. The dimensions of the latter, however, are gigantic compared with those of this Australian form.

Localities.—Growing on *Sertulariella divaricata*, var. *subdichotoma*, from Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898—rare. Also on a Polyzoön (without Station number), New South Wales.

Campanularia hincksii has been recorded frequently from the eastern waters of the North Atlantic Ocean, from Norway to the south of Madeira; less frequently from the western portion of the North Atlantic (by Verrill and Nutting), while records by Torrey alone tell of its presence on the west of North America. Broch says of it:—"Die Art scheint ihre Hauptverbreitung in den subarktischen Teilen des Atlantischen Ozeans zu haben."⁵ So far as I am aware, the species has not hitherto been recorded from the Southern Hemisphere.

CAMPANULARIA TINCTA, *Hincks* (?).

Campanularia tincta, Hincks, Ann. Mag. Nat. Hist. (3), vii., 1861, p. 280, pl. xii. *Id.*, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 57, pl. i., figs. 4-6. *Id.*, Warren, Ann. Natal Govt. Mus., i., 1908, p. 337, fig. 18. *Id.*, Vanhöffen, Deutsche Südpolar Exped., 1901-1903, xi., Zool. iii., Hydroiden, p. 296, fig. 17.

⁵ Broch—Die Hydroiden der arktischen Meere—in Fauna Arctica, v., Jena, 1909, p. 225.

Hincksia tincta, L. Agassiz, Cont. Nat. Hist. U.S. (2), iv., p. 355.

Stations 36 and 54.

The specimens I have referred to this species possess no trace of gonosome. Although the characters of the trophosome agree with those of this species as described by authors, and especially with those of specimens described by Dr. Warren from Natal, there is so great a similarity between this trophosome and that of typical examples of *Campanularia volubilis* (Linn.), that, in the absence of the gonangium, I hesitate definitely to decide. These specimens, while they vary considerably as regards the character of the peduncle, generally show more definite undulations or twistings than most authors describe, these reaching in some cases even to the base; in this respect they resemble Warren's specimens. The teeth of a hydrotheca vary in number from eleven to thirteen.

Dimensions.—

Peduncle, length	0.35-1.22 mm.
" diameter	0.05-0.07 mm.
Hydrotheca, depth	0.35-0.42 mm.
" diameter at mouth...	0.18-0.28 mm.

The dimensions of parts agree sufficiently closely with those calculated from Hincks' figure, and with those given by Warren, but they are much smaller than Bale's figures imply, and they are also considerably smaller than Vanhöffen's specimens from the Antarctic, and than specimens I have recorded from the Falkland Islands.

Localities.—Growing on *Sertularella adpressa* from Station 36, off Botany Bay, one mile from shore; depth, 23 to 20 fathoms; bottom, sand to rock; 11th March, 1898. Also growing on *Thuiaria sinuosa* from Station 54, within Jervis Bay; depth, 10 to 11 fathoms; bottom, seaweed and sand; 20th March, 1898.

Previous Australian records are:—Australia, "collected in the neighbourhood of Melbourne and Geelong" (Hincks); Port Phillip and Portland (Bale).

CLYTIA ELONGATA, *Marktanner-Turneretscher*.

?*Clytia elongata*, Marktanner-Turneretscher, Ann. K.K. Hof-mus. Wien, v., 1890, p. 215, pl. iii., fig. 11.

Clytia elongata, Warren, Ann. Natal Govt. Mus., i., 1908, p. 339, text fig. 20.

Creeping on a Polyzoan is a stolon from which spring rare simple Campanularian stems. The stems are as a rule comparatively short, for they frequently scarcely exceed the length of the hydrotheca. A variable number of rings mark the top and base

of the stem, three or four being most common, while the intermediate portion is smooth, or bears a set of fairly definite rings, or is indefinitely corrugated after the manner of the stem of the common European *Campanularia volubilis*. Upon the stems are placed firmly the exceedingly long and slender hydrothecæ, four times as long as broad, almost cylindrical in shape, but in the proximal half tapering gradually to the base. A weakly developed diaphragm surrounds the wall a short distance from the base and the margin is cut into ten or eleven long but rounded teeth, which are separated by deep, semicircular embayments. Rarely the margin of a hydrotheca is duplicated.

Scarcely a trace of cœnosarc remained, and no gonosome was present.

Dimensions.—

Stolon, diameter.....	0.04-0.06	mm.
Stalk, length	0.38-1.17	"
" diameter	0.048-0.06	"
Hydrotheca, length	0.66-0.87	"
" diameter at mouth...	0.19-0.25	"

Remarks.—These specimens are without doubt identical with Marktanner's specimens, from which they differ only in having somewhat larger hydrothecæ, with ten or eleven instead of twelve teeth. On the other hand, they are smaller than Warren's specimens, and differ moreover in having the ringing of the stem less definite, and in lacking a "terminal small spherule." The possession of such a spherule may on occasion be a good specific character, but the fact that in Warren's examples it is "very variable in size," and can scarcely be distinguished in his figures, seems to show that its occurrence there is scarcely so significant.

That Warren, ignorant of Marktanner's species, should have elected to call his specimens *elongata* also, is a coincidence witnessing to the distinctive character which rests in the long, narrow hydrothecæ.

Locality.—Creeping on a Polyzoon, from off the coast of New South Wales; March, 1898; very rare.

The species is new to the fauna of Australia. Previous records are from Auckland, New Zealand (Marktanner), and Bird Island, Algoa Bay, 40 fathoms (Warren).

HEBELLA CALCARATA (*A. Agassiz*).

Lafœa calcarata, *A. Agassiz*, Mem. Mus. Comp. Zool. Harvard, i., 1865, p. 122, fig. 190. *Id.*, Billard, Exped. Sci. "Travailleux" et "Talisman," viii., 1907, p. 174.

- Lafoëa cylindrica*, Von Lendenfeld, Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 912, pl. xl., figs. 4, 5.
- Lafoëa scandens*, Bale, Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 758, pl. xiii., figs. 16-19. *Id.*, Warren, Ann. Natal Govt. Mus., i., 1908, p. 341, fig. 21.
- Hebella cylindrata*, Marktanner-Turneretscher, Ann. K.K. Hofmus. Wien, v., 1890, p. 214, pl. iii., fig. 15.
- Hebella contorta*, Marktanner-Turneretscher, *Op. cit.*, p. 215, pl. iii., fig. 17.
- Hebella cylindrica*, Pictet, Rev. Suisse Zool., i., 1893, p. 41, pl. ii., fig. 36.
- Hebella calcarata*, Nutting, Bull. U.S. Fish. Comm., xix., 1901, p. 353, fig. 56.

Stations 10, 36, and 44.

Localities—Common on *Synthecium orthogonium* from Station 10, off Broken Head, two to four and a half miles from shore; depth, 28 fathoms; bottom, fine sand; 22nd Feb., 1898.

Rare on *Sertularella adpressa* and *Synthecium orthogonium* from Station 36, off Botany Bay, one mile from shore; depth, 23 to 20 fathoms; bottom, sand to rock; 11th March, 1898.

Rare on Polyzoon from Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898.

Family L A F O Ë I D Æ.

LAFOËA GRACILLIMA, Alder.

Forma typica.

- Campanularia gracillima*, Alder, Trans. Tynes. Nat. F. Club iii., 1857, p. 39, pl. vi., figs. 5, 6.
- Lafoëa fruticosa*, Hincks (in part), Hist. Brit. Hydroid Zoophytes, 1868, p. 202, pl. xli., fig. 2. *Id.*, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 64, pl. ii., fig. 1.
- Lafoëa gracillima*, G. O. Sars, Forhandl. Vidensk. Selsk. Kristiania, 1873, p. 27, pl. iv., figs. 19-21. *Id.*, Bonnevie, Norwegian North Atlantic Expedition, 1876-78, Zool., Hydroida, 1899, p. 65, pl. v., fig. 2a. *Id.*, Jäderholm, Kungl. Svenska Vetens.-Akad. Handl., xlv., 1909, p. 74, pl. vii., figs. 6 8. *Id.*, Broch, Die Hydroiden der arktischen Meere in Fauna Arctica, v., 1909, p. 156, figs. 17, 18.

Station 34.

Small colonies belonging, without doubt, to this widely distributed species, occur growing upon a stragglng Polyzoon. The colonies cannot compare in size with the well-developed examples found in the North Sea, for they are less than 1 cm. high, but as regards fasciculation, irregular arrangement of hydrothecæ, and details of hydrothecal shape, they are in perfect agreement with European specimens of forma *typica*. The stalk of the hydrotheca is marked by only a single loose twist, and, of the many variations figured by Broch, the hydrothecæ almost exactly resemble those of specimens of the typical form from the mouth of the Christiania Fjord (Broch, 1909, fig. 17, v., p. 157.)

Dimensions.—

Stem tube, diameter.....	0.08-0.12	mm.
Hydrotheca, length ⁶	0.52-0.63	„
„ diameter at mouth...	0.139-0.147	„

These measurements show that the parts of the Australian specimens are smaller than those of Mediterranean examples recorded by Billard⁷ from south-west of Toulon, although they agree with those of North Sea specimens in my collection.

Locality—Station 34, off Port Jackson, three and a half to two and a half miles from shore; 39 to 36 fathoms; bottom, sand and mud; 10th March, 1898.

Only a single previous record of this species has been made from Australian waters, Hincks, (1868, p. 203) mentioning a specimen from Bass Strait as being with "little doubt" identical with *Lafoëa fruticosa*. Bale, in his "Catalogue," has followed him in this mistaken synonymy.

LAFOËA SERRATA, *Clarke*.

Lafoëa serrata, Clarke, Bull. Mus. Comp. Zool. Harvard, v., 1879, p. 242, pl. iv., fig. 25. *Id.*, Thornely in Herdman, Ceylon Pearl Fisheries, pt. ii, Suppl. Rep. viii., Hydroida, 1904, p. 116. *Id.*, Hartlaub, Zool. Jahrb. Jena, Suppl. 6, iii., 1905, p. 595, fig. Q². *Id.*, Billard, (1) Exped. Sci. "Talisman" et "Travailleur," viii., 1907, p. 178, and (2) Arch. Zool. exper., vii., 1907, p. 340. *Id.*, Ritchie, (1) Rec. Indian Mus., v., pt. 1, 1910, p. 9, and (2) Proc. Zool. Soc., 1910, 2, p. 815.

⁶Including stalk.

⁷Billard—Exped. Sci. "Travailleur" et "Talisman," viii., 1907, Hydroides, p. 176.

Stations 44, 47, 48, and 54.

Specimens of this widely distributed epizoic species occur on several hosts from several stations. The abundance of the hydrothecæ which bristle upon the weathered axis of an Isid Alcyonarian from Station 47 is specially remarkable, the growth resembling that of *Lafoea contorta*, Nutting, from Hawaii, which differs from the present species only in the fact that annular thickenings of the hydrothecal wall are absent from the adnate portion, yet in Nutting's figures⁸ striations are shown on some of the hydrothecæ. There is much variation in the relative proportions of adnate and free portions, this being in the main due to extensions to which the free portion is liable by the addition of new margins. As many as six repetitions may occur, more than doubling the length of the free portion. In the following table of dimensions, therefore, I give, as being more constant, the length of the primary hydrotheca of the repeated series. There is also much variation in the distinctness of the striations which occur on the horizontal portion; for while these are well marked in some specimens, in others, they are almost invisible, and the latter are hard to distinguish from hydrothecæ of *Filillum serpens*, on which also faint striations sometimes occur.

Gonosome.—The gonosome, of which I have seen no description, is aggregated in coppinia form, an elongated cluster surrounding the surface upon which the colonies are creeping. The essential part of the structure is very similar to that of *Filillum serpens*, the gonangia appearing in surface view as close-set irregular polygons, each with a slightly raised circular aperture. Between these in one case project long tubes, which stand out stiffly from the surface of the coppinia, unlike the curling, close-lying individuals of *F. serpens*. In the only other example I have seen, the tubes do not project, but instead lie closely apposed to each other, parallel to the surface of the coppinia. In cross section, these tubes are almost rectangular, for they are compressed in a direction at right angles to the surface of the coppinia. Thus the coppinia is enclosed in an irregular double-walled case formed of close-set, adnate tubes, and having a distant resemblance to a structure of basket-work.

In cross section of the coppinia there was seen, surrounding the Alcyonarian axis upon which the colony was creeping, an irregular layer of tubes of small calibre, oval in cross section, their long axis parallel to the surface of the substratum. These correspond to the network of tubes which forms the rhizoidal structure of the colony in general. From them arise radially long strong-walled gonangial tubes which sometimes at least (as

⁸Nutting—Bull. U.S. Fish Comm. for 1903, pt. iii., 1905, pl. ix., figs. 8, 9, p. 945.

point to minute knobs of chitin which form a ring on the inner surface of the hydrotheca. The aperture of the hydrotheca is circular, the margin entire, set at a slight angle to the axis of the hydrotheca, not everted, but almost always repeated twice or thrice, owing to the successive regeneration of hydranths. The walls of the hydrotheca are colourless and delicate. The hydrotheca narrows gradually to the base and passes imperceptibly into the peduncle. This is of comparatively wide diameter, is about one-third as long as the hydrotheca, although there is much variation, and is always marked by only a single strong constriction which occurs very near its junction with the stolon. Scarcely a trace of the hydranths remained, and there was no trace of the gonosome.

Dimensions.—

Stolon, diameter	0.042 mm.
Hydrotheca, length to diaphragm	0.34-0.39 mm.
" diameter	0.09-0.10 "
Peduncle, length	0.07-0.15 "
" diameter	0.039 mm.

Systematic Position.—These Australian specimens agree with the very short and scrappy description and with the figure by Allman, except in a single point, that the peduncle is marked by a definite constriction of which there is no sign in the American examples. The hydrothecæ, except for this constriction, much resemble those of *Lafitea dumosa*, but that species is twice as large, of less elegant build, with more dumpy peduncles, and is much stronger and coarser in appearance.

The species is *Hebella*-like, but until the gonosome has been discovered, it would be rash to remove it from the genus in which it was placed by Allman.

Locality.—Growing upon a Polyzoon from Station 57, off Wata Mooli, three and a half to four miles from the shore; depth, 59 to 54 fathoms; bottom, mud; 22nd March, 1898.

I am aware of no previous record, other than that given by Allman—south of Marquesas, Florida, United States, 140 fathoms. The extension of range from the western shore of the tropical Atlantic to the southern Pacific is remarkable.

LICTORELLA ANTIPATHES (*Lamarck*).

Sertularia antipathes, Lamarck, Hist. nat. Anim. sans Vertèbres 1816, p. 115.

Laomedea antipathes, Lamouroux, Hist. polyp. corral. flexibles, 1816, p. 206, pl. vi., figs. 1a, B.

Campanularia rufa, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 54, pl. i., fig. 1.

Lictorella halecioides, Allman, 1888 (but not *Lafoëa halecioides*, 1874), Sci. Res. Rep. "Challenger" Exped., Zool. xxiii., Hydroida, Part ii., p. 35, pl. xvii., figs. 1, 2. *Id.*, Kirkpatrick, Sci. Proc. Roy. Dublin Soc. (n.s.), vi., 1890, p. 608.

Lictorella antipathes, Billard, Ann. Sci. Nat., Zool., (9), vi., 1907, p. 216, fig. 1; *Id.*, Billard, *Op. cit.*, (9), ix., 1909, p. 312; *Id.*, Billard, *Op. cit.*, (9), xi., 1910, p. 6, fig. 1.

Stations 34 and 40.

Many specimens of this species were obtained. Although they are much broken, the robustness of the stems, one of which is 5 mm. in diameter immediately above the basal attachment, indicates that some of the colonies must have exceeded by far the height of four inches given by Allman. The colours of the perisarc are unusual, the stems and branches, and even the ultimate twigs appearing black, the hydrothecæ dark brown. "Joints," due to the destruction and regeneration of successive hydrothecæ, are frequent on the peduncles of the hydrothecæ.

Dimensions.—

Ultimate twigs, diameter	0·11-0·15 mm.
" " distance between hydrothecæ...	0·49-0·67 "
Hydrotheca, ⁹ length (margin to internode process)	0·42-0·48 "
" " diameter at mouth	0·18-0·21 "

These measurements are somewhat larger than Billard's (1907, p. 216) measurements of Lamarck's type specimen, but they agree with the same author's measurements of the "Challenger" *Lafoëa halecioides* (1910, p. 6).

Remarks.—Comparison of the present specimens, identical with the *Lictorella halecioides* of the "Challenger" Report (see Billard, 1910), with specimens of *Lictorella pinnata* from Lat. 60° 6' N., 8° 14' W., in the neighbourhood where Allman's type specimens of *Lafoëa halecioides* were obtained, confirms E. T. Browne's¹⁰ surmise that Allman was mistaken in identifying the Australian *Lictorella* with that which he had previously obtained in the North Atlantic. That is to say, *Lictorella pinnata* (Sars), (*Lafoëa halecioides* of "Porcupine" Report), is distinct from *Lictorella antipathes* (Lamarck), (*Lafoëa halecioides* of "Challenger" Report). I have not been able to distinguish on the fragment of a Faroe Channel specimen in my possession

⁹ The dimensions of the primary hydrotheca are given, reduplicated margins, which may add 0·1 mm. to the length, being omitted.

¹⁰ Browne—Journ. Mar. Biol. Assoc. Plymouth, viii., 1907, p. 26.

the "very minute pedunculated cups" which Browne found on his specimen from the Bay of Biscay, and which would make necessary the transference of the latter to the genus *Zygophylax*.

Localities.—Station 34, three and a half to two and a half miles off Port Jackson; depth, 39 to 36 fathoms, sand and mud; many colonies. Station 40, three miles off Wata Mooli; depth, 52 fathoms, sand and boulders; few fragments.

LICTORELLA CONCINNA,¹¹ *sp. nov.*

(Plate lxxxviii., figs. 3, 4.)

Station 44.

This species has been created for a very small number of colonies which were found at Station 44.

Trophosome.—The largest colony, which is not quite complete, is 25 mm. high. It consists of an axial tube surrounded by a few fascicular tubes which accompany the stem, but occur only on the largest of the branches. On the axial tube are borne hydrothecæ and branches. The latter are pinnately arranged, are subalternate, lie in one plane, and appear to be in pairs, each pair being separated by twice the distance which intervenes between the members of a pair. Approximately, two hydrothecæ spring from the stem between two pairs of branches, while between the branches of a pair only one is present. The stem shows no traces of division into internodes, but it bears alternate hydrothecæ at regular intervals even to the base. The branches are generally simple and monosiphonic, but rarely there occurs a larger individual, slightly fascicled, and bearing pinnate branches like the stem. All the branches are delicate and elegant, are slightly sinuous, as is the axial tube of the stem, and bear at each bend a hydrotheca. There are no regular nodes, though a rare one occasionally appears half way between two hydrothecæ.

The hydrothecæ are very graceful structures. They lie in one plane, and arise alternately from opposite sides of the stem and branches. One is always present at the base of a branch, close to, but not quite in the angle formed between branch and stem. Each hydrotheca rests on a well-marked projection from stem or branch. On this is perched a long cylindrical stalk, slightly constricted at the base, and widening at its upper extremity into the hydrotheca. The stalk is half or a little more than half the length of the hydrotheca. The hydrothecæ are deep, tubular, and cyathiform, the abcauline profile forming a simple convex curve, the adcauline a compound curve, first convex, then concave.

¹¹ *Concinus*, neat, elegant.

They project upwards and outwards from the stem at an angle varying about 45°. The aperture is round and smooth-lipped, and is, along with the distal part of the hydrotheca, turned upwards so that it lies obliquely to the axis of the hydrotheca. This angularity is increased by the occurrence of additional regenerated margins which are frequently present. The upward bending of its extremity gives to the hydrotheca a peculiar asymmetrical appearance which occurs in but few species. A well-defined diaphragm separates a hydrotheca from its stalk.

Gonosome.—Not present.

Dimensions.—

Height of colony	10 mm.
Axial tube, diameter	0.11 mm.
Branch, diameter	0.07-0.08 mm.
Hydrotheca, length	0.24-0.31 "
" diameter at mouth ..	0.10-0.11 "
Stalk, length.....	0.13-0.22 "

Remarks.—The present species closely approaches *Lafoëa convallaria*, Allman, but here the habit of the hydrotheca is more rigid; the curving of the pedicles does not occur; that of the hydrotheca is less exaggerated; and the hydrothecæ themselves are more tubular and less flask-shaped. The trophosome of *Lictorella concinna* exactly resembles that of *L. cervicornis*, Nutting, with the exception that in the former nematophores are entirely absent. So remarkable is the resemblance between the two species that I have repeatedly, but in vain, made search for traces of nematophores, thinking that I might have previously overlooked them. Without evidence that the presence or absence of such structures falls within the range of everyday variation, I must consider their absence significant. The presence of these structures would, in the classification usually adopted, give Nutting's species the designation *Zygophylax cervicornis* (Nutting).

Locality.—Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898. Very rare.

Type Specimens.—In the Australian Museum, Sydney.

CRYPTOLARIA ARBORIFORMIS¹², *sp. nov.*

(Plate lxxxiv., fig. 1; Plate lxxxvii., fig. 7.)

Station 44.

Trophosome.—A single robust colony, 15 cms. high, with thick gnarled stem, 5 mm. in diameter at the base, which immediately

¹² *Arbor* a tree; *formis* implying resemblance in shape.

divides into several stout branches, one of which anastomoses later with the stem. From the stem spring branches, large and small, with indescribable irregularity. Irregular offshoots spring from these to the fourth degree. All the branches are of the same character as the stem, bearing the aspect of bare, gnarled limbs of some weather-beaten tree. All, like the stem, are strongly fascicled, and from most the ultimate, more delicate branchlets, on which the hydrothecæ are exposed, have disappeared. Where ultimate branchlets occur, they are seen to lie in one plane and to spring in pinnate fashion from the branches, those on one side lying almost opposite those on the other. The ultimate branches are incomplete, and the whole colony appears to have undergone severe weathering, but in the portions which exist, fascicle tubes accompany the axial tube through its whole length. The fascicular tubes are narrow with thick brown walls, perforated by large circular openings, which allow communication between the cavities of adjacent tubes. They generally run in close parallel courses, aggregates of many tubes, which entirely obscure the axial tube and its appendages; but at places, the tubes lose their regularity and twist, double, and branch, forming a knotted maze which appears as a slight swelling on the branch. Whether this contorted structure is a mere frolic of growth, or whether it has special purpose, the entire absence of even a trace of cenosarc renders it impossible to say.

The axial tube is not divided into internodes, but it bears alternate hydrothecæ at regular intervals. These lie in one plane, and are somewhat close-set, the base of one hydrotheca lying opposite the summit of its predecessor.

The hydrothecæ are smaller and less graceful than is usual in this genus. They are somewhat short and dumpy, two and a half times as long as broad, narrow at base, widening upwards, and contracting slightly again at the mouth. They are adnate to the axial tube for almost the whole of their length, only a small portion projecting beyond the profile of the branch, even where fascicle tubes are few in number. The aperture is round, but is difficult to observe, as the margin is usually damaged; there are no signs of reduplication of margin. The hydrothecæ bend outwards from the stem in a gradual curve, so that the axis of the terminal portion of the hydrotheca faces upwards and away from the branch at an angle of about 50° , but the curve is stiff and lacks the finish and grace which characterises the hydrothecæ of the other species in this collection. No diaphragm occurs at the base of the hydrotheca, the cavity of which opens unrestricted into that of the axial tube; but the free end of the adcauline wall, which has been gradually sloping towards the

abcauline, here bends suddenly towards the interior of the hydrotheca, forming a narrow ledge at its base. *Gonosome*.—unknown.

Dimensions.—

Colony, height	15 cms.
Stem, diameter at base	5 mm.
Fascicle tube, diameter	0.08 mm.
Hydrotheca, length of adnate portion...	0.28-0.31 ,,
" " " free portion	0.08-0.11 ,,
" " " greatest diameter.....	0.10-0.12 ,,

It is difficult to decide to which of the older species of the genus *Cryptolaria arboriformis* is most closely related; for its gnarled, tree-like habit, and its dumpy hydrothecæ, almost altogether adnate, with their cavity cut off from that of the axial tube by an inturned ledge, distinguish it from every other species.

Locality.—Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898.

Type Specimens.—In the Australian Museum, Sydney.

CRYPTOLARIA CONFERTA, *Allman*,

var. AUSTRALIS, *var. nov.*

(Plate lxxxiv., fig. 2; Plate lxxxvii., fig. 1.)

Cryptolaria conferta, Allman, Mem. Mus. Comp. Zool. Harvard, v., 1877, p. 17, pl. xii., figs. 6-10. *Id.*, Clarke, Bull. Mus. Comp. Zool., v., 1879, p. 244, pl. iii., figs. 14-20. *Id.*, Campenhausen, Abh. Senck. Ges. Frankfurt, xxiii., 1896, p. 309. *Id.*, Versluys, Mem. Soc. Zool. France, xii., 1899, p. 32. *Id.*, Pictet and Bedot, Res. Camp. Sci. Monaco, fasc. xviii., 1900, Hydriaires, p. 17, pl. ii., fig. 3, pl. iii., fig. 7.

Lafoëa conferta, Billard, Exp. Sci. "Travailleur" et "Talisman," viii., 1907, Hydroïdes, p. 177.

Stations 40 and 42.

Trophosome.—The stems of the colonies are flexible and straight, the largest about 8 cms. high, yet scarcely one millimetre in diameter at the base. From base upwards the stem bears pinnate branches of finer texture than itself, and these occur at regular intervals from each other, a distance of 3 mm. separating two on the same side; while those on the opposite side alternate, and both series lie in one plane. The pinnæ are generally simple, from 1 to 2 cm. long, but they are frequently replaced by long

slender branches, up to 5 cm. in length, which in all respects, except robustness, resemble the stem, bearing pinnate branchlets to the third degree. Stem, pinnæ, and branches are fasciated, although a considerable portion of each termination remains free. Many of these pinnate colonies grow in association, and as their connection is secured by abundant anastomosis, a flabellate mass 15 cm. in breadth may be created.

The minute characters agree with the description of *Cryptolaria conferta* by Allman, amended by later observers. The hydrothecæ are long and slender, having, as a rule, about one-third of their length free. They are regularly alternate and are close-set, the base of one hydrotheca lying opposite the point where the preceding hydrotheca becomes free from the stem. They are cylindrical for the greater part, but narrow slightly towards the base, the diameter of the adnate portion equalling that of the axial tube at the same level. The inner wall of the hydrotheca ends abruptly with a slightly thickened knob, and the "distinct floor" of the hydrotheca, which Allman describes and figures, is absent, as Clarke noted in specimens of *Cryptolaria conferta* from the Gulf of Mexico, Versluys in Testigos Islands specimens, and as Campenhausen found, exceptionally, in examples of the same species from Ternate. The hydrotheca curves gradually and gracefully outwards from base to termination, and its round, smooth aperture varies from a position parallel to the long axis of the branch to an upwards inclination of 30°. The latter position is the more usual, however, for the former is brought about only by the unequal growth of repeated fresh margins, of which sometimes as many as eleven are present. In these specimens perforations connect the cavities of the peripheral with those of the axial tubes, though I am unable to confirm the existence of the regular arrangement which Clarke claimed for them.

As the hydranth of *Cryptolaria* remains undescribed, except for an observation on that of *Cryptolaria operculata* which I have recently recorded,¹³ I do not hesitate to add a note on the rather poorly preserved hydranths of *Cryptolaria conferta* before me, notwithstanding that those of the following species are more fully described. In the state of contraction in which all are, they appear as elongate cylindrical bodies with seven to nine short tentacles surrounding a low, dome-shaped hypostome. The ectoderm is thin throughout, but elongated endoderm cells project into the digestive cavity beneath the level of the bases of the tentacles. The hydranth narrows somewhat proximally, and is terminated by a wider ccenosarcal disc which is attached to the

¹³ Ritchie—Rec. Indian Mus., v., 1910, p. 10.

wall of the hydrotheca by short strands affixed to minute chitinous projections on the interior of the perisarc, a considerable distance above the apparent "base" of the hydrotheca. The occasional occurrence of several series of the bright dots which represent the projections, tells, as do repeated margins, of successive generations of hydranths.

Gonosome.—Not represented.

Dimensions.—

Hydrotheca, length of adnate portion...	0.49-0.56 mm.
„ length of free portion.....	0.22-0.32 „
„ diameter at base.....	0.08-0.096 „
„ diameter at mouth.....	0.11-0.12 „

Systematic Consideration.—Allman in his "Challenger" Memoir on the Hydroida (Pt. ii., p. 39) admits, as will anyone who has paid attention to the genus, that there is "comparatively little to rely on" in distinguishing the species of *Cryptolaria*. In such case, he has laid special stress upon the differences in the form of the ramification, but even this, he allows, "varies within very narrow limits." In the "Challenger" Report, almost all the species are primarily distinguished by their ramification—a character liable to much variation induced by environment. I am of opinion that, separated from minute structural distinctness, differences of habit cannot in general be considered specific, and therefore I regard the present regularly pinnate, flabelliform colonies, which in the main differ from typical *Cryptolaria conferta* only in their habit, as belonging to that species. But, indeed, Billard (1907, p. 178) has already noted that, in specimens from the Bay of Biscay, from off Cape Spartel, Morocco and the Soudan, pinnate ramification prevailed. The minute structure and proportions of the hydrothecæ of the Australian specimens are similar to those described and figured for *Cryptolaria conferta*, although the mouth diameter is a little smaller than that of Allman's type specimens, judging by the magnified figure of the latter given by Clarke in which the mouth is represented as being 0.16 mm. broad. The remaining dimensions agree with the type and with Billard's measurements.

Pietet and Bedot (1900, p. 19), as also Hartlaub (1904, p. 13), and Browne¹⁴ express the opinion that *Cryptolaria crassicaulis*, Allman, 1888, is synonymous with *Cryptolaria conferta*, Allman, 1877. After examination of portion of the type specimen of the former, I must differ from those authors.¹⁵ Apart altogether from the habit of the colonies, an uncertain and untrustworthy character, sufficient specific difference lies in the minute structure

¹⁴ Browne—Journ. Mar. Biol. Assoc. Plymouth, viii., 1907, p. 29.

¹⁵ See Plate lxxxvii., fig. 4.

of the hydrotheca. Examination of the following table indicates a marked difference in size and proportions:—

	CRYPTOLARIA CONFERTA.			CRYPTOLARIA CRASSICAULIS.	
	Type from Clarke's figures. ¹⁶	Billard's specimens.	Present specimens.	From Hartlaub's fig. of <i>C. conferta</i> . ¹⁶	Allman's type. ¹⁷
Hydrotheca, length of adnate portion...	0.6	0.35-0.50	0.49-0.56	1.0	0.92-0.98
Hydrotheca, length of free portion	0.3	0.26-0.385	0.22-0.32	0.70	0.52-0.83
Hydrotheca, diameter at base	0.1	?	0.08-0.096	0.08	0.08-0.11
Hydrotheca, diameter at mouth	0.16	0.14-0.16	0.11-0.12	0.26	0.29-0.35

Measurements are in millimetres.

These differences are visible, firstly in the very much larger size of the hydrothecæ of *Cryptolaria crassicaulis*, and, secondly, in the shape of the hydrotheca; for while those of *C. crassicaulis* are four times as wide at the mouth as at the base, those of *C. conferta* are only one and a half times. The greater narrowing emphasises the tapering of the hydrothecæ in *C. crassicaulis* and produces a cornucopia appearance, distinct from the almost cylindrical shape of the hydrothecæ of *C. conferta*. In the specimens before me there is also a great difference in the robustness of the perisarc, which is more strongly developed in *C. conferta* (the smaller in dimensions) than in *C. crassicaulis*, as the following measurements indicate. But differences in thickness of perisarc are frequently of no significance specifically.

	<i>C. conferta.</i>	<i>C. crassicaulis.</i>
Thickness of outer wall of hydrotheca	12-22 μ ...	9-15 μ
Thickness of adnate wall of hydrotheca at base	14-27 μ ...	11-15 μ
Thickness of general perisarc	15-24 μ ...	9-19 μ

I am of opinion, judging from the size and shape of the hydrothecæ, that the specimens doubtfully recorded by Hartlaub from

¹⁶ These measurements, estimated from magnified figures, must be taken as approximate only.

¹⁷ See Plate lxxxvii., fig. 4.

Antarctic Seas as *Cryptolaria conferta*, Allman(?),¹⁸ the dimensions of which are given above, belongs not to that species but to *C. crassicaulis*.

The resemblance of the habit of these Australian specimens to that of *Cryptolaria pulchella* led me to examine Allman's type of the latter, a fragment of which was kindly lent me by Mr. R. Kirkpatrick, of the British Museum. Allman's figures of this species in the "Challenger" Reports are utterly misleading, for they indicate a tubular hydrotheca of constant width throughout all its length, with a distinctly flaring margin. The fragment of Allman's type which I have examined, possessed hydrothecæ without flaring margins, wide at the mouth, and diminishing in calibre very markedly towards the base, where they are very narrow. The hydrothecæ, indeed, are similar in shape to those of *C. crassicaulis*, though they are less in size. They show that *C. pulchella* is distinct from *C. conferta*, var. *australis*.

Localities.—Station 40, off Wata Mooli, three miles from shore; depth, 52 fathoms; bottom, sand and boulders; 12th March, 1898. Several young colonies growing on a Polyzoon.—Station 42, off Wata Mooli, six to eight and a half miles from shore; depth, 70 to 78 fathoms; bottom, coarse sand; 13th March, 1898. Many fine colonies.

Distribution.—*Cryptolaria conferta* has been recorded from the Atlantic Ocean by several investigators; from the Gulf of Mexico and the West Indies to the Azores (Pictet and Bedot, 1900), and the Bay of Biscay (Billard, 1907; Browne, 1907). I am aware of only two records from the Pacific Ocean; from the Eastern Pacific—off the west coast of Central America (Clarke, 1894), and from the Western Pacific—from Ternate in the Molucca Islands (Campenhausen, 1896). The species is new to Australia Seas.

Type Specimens of variety.—In the Australian Museum, Sydney.

CRYPTOLARIA CRASSICAULIS, Allman.

var. DIMORPHA¹⁹, var. nov.

(Plate lxxxvii., figs. 5, 6; cf. fig. 4.)

Cryptolaria crassicaulis, Allman, Rep. Sci. Res. "Challenger," Exped., Zool., xxiii., Hydroida, Part ii., 1888, p. 41; pl. xix., figs. 3, 3a.

¹⁸ Hartlaub—Voyage du S. Y. "Belgica," 1897-99, Zool., Hydroïden, 1904, p. 13, pl. ii., fig. 1.

¹⁹ δὶμορφος, of two forms.

Cryptolaria conferta?, Hartlaub, Res. Voyage S.Y. "Belgica," 1897-99, Zool, Hydroiden, 1904, p. 13, pl. ii., fig. 1 (see above under *Cryptolaria conferta*).

Station 48.

A poor colony, 6 cms. high, with strong stem, and few branches arranged in approximately pinnate fashion, is the more typical representative of this species. The varietal name indicates, however, the existence of two distinct growth forms assumed by the colonies.

Form 1. *Trophosome*.—The habit of this form is more robust than that of the type of *Cryptolaria crassicaulis*, the hydrothecæ appearing larger even to the naked eye, and the ultimate branches less slender and flaccid. The hydrothecæ are distichous, regularly alternate, and close-set, the base of one lying on a level with the point where its predecessor becomes free. They are long and of large calibre, adnate for rather more than half their total length. Cylindrical for the greater part, they narrow markedly towards the base, the diameter of which is generally less than one-third that of the aperture; yet the average diameter of the adnate portion is much greater than that of the axial tube at the same level. The hydrotheca-cavity passes without interruption into that of the axial tube, and a smaller perforation situated alongside the base of the hydrotheca gives passage to a strand of cœnosarc passing between the latter and the associated peripheral tube. The hydrothecæ curve gradually outwards, the apertures facing outwards and slightly upwards, while the profile of the axial tube follows the curved adcauline outline of the hydrotheca.

Form 2. *Trophosome*.—The hydrothecæ in the known species of *Cryptolaria* arise from an axial tube which is, for the most part, surrounded by peripheral tubes, and to this tube they are adnate for the greater portion of their length—except in some cases, where, under the peripheral tubes, they are free. In some unusual specimens before me, the axial tube, unencumbered by accessory tubes, has grown along a *Gemmelaria*-like polyzoon; and, while giving rise in places to normal *Cryptolaria* branches, more frequently bears *solitary, free hydrothecæ* which were at first mistaken for examples approaching the smooth variety of *Hebella striata*, Allman. These hydrothecæ grow at right angles to the creeping stolon-like tube, and are almost straight, the marked curve of the adnate hydrothecæ being entirely lost. In this state, the narrowed base of the adnate hydrotheca is represented by a short peduncle supporting the free one. But except for the straightening, the shape of the two types of hydrotheca is similar, as are their dimensions and proportions.

The hydranths are attached to the hydrotheca some short distance above the free end of the internal wall, the level being marked by a slight constriction of the hydrotheca.

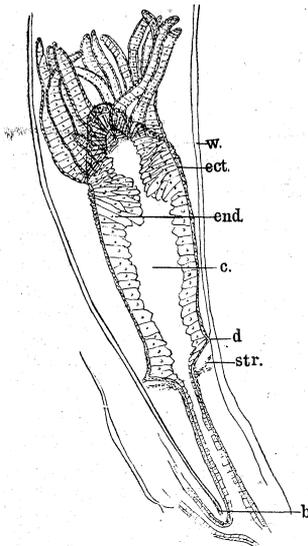


Fig. 126.

Hydranth of *Cryptolaria crassicaulis* var. *dimorpha* $\times 70$; *w*, external wall of hydrotheca; *ect.*, ectoderm; *end.*, endoderm; *c.*, cavity of hydranth; *d.*, basal disc of attachment; *str.*, supporting strands; *b.*, base of internal wall of hydrotheca.

Low prominences set in a ring stud the internal surface of the perisarc at this point, and to these a disk of cœnosarc at the base of the hydranth is attached. But beneath the attached basal disc, a second attachment occurs, for irregular strands of sarcodæ branch from the ectoderm immediately below the hydranth and are attached to the walls of the hydrotheca. A similar development occurs in *Laomedea geniculata*²⁰. The hydranths are strongly contractile, and when fully withdrawn form a very short stout cylinder. Expanded, each consists of a long narrow cylindrical neck, surmounted by a fusiform "head," which terminates in a small sharply-conical hypostome. This is surrounded by a circle of sixteen or seventeen tentacles.

As to minute structure—The tentacles consist of a moderately thick ectoderm which contains few nematocysts arranged in whorls, and of skeletal endoderm, the septa between the cells of which stretch across the interior of the tentacle. In the body-wall of the hydranth the ectoderm is comparatively thin, and it is lined by a thick endoderm composed of columnar cells which, especially beneath the hypostome, project far into the digestive cavity. *Gonosome* not present.

Dimensions.—

Organs.	Form 1. Adnate specimens.	Form 2. Free specimens.
Hydrotheca, length of adnate portion	0.88-1.01 mm.	} 1.54-1.59 mm.
„ length of free portion....	0.70-0.98 „	
„ diameter at base.....	0.14-0.18 „	
„ „ „ mouth.....	0.38-0.52 „	

²⁰ See Broch—Hydroiden: in Fauna Arctica, Jena, v., 1909, p. 183, fig. 38c.

Remarks.—The consideration of the relationship existing between the simple free form of this variety and its more typical form with adnate hydrothecæ throws some light on the probable origin of *Cryptolaria*. An example before me illustrates this. A single free hydrotheca is growing out from the creeping stolon. At the base of the hydrotheca the stolon, leaving the substratum, curves sharply round and having reached the stalk of the hydrotheca, clings to, and ascends this, and part of the hydrotheca as well. The hydrotheca appears now to be adnate, and the erstwhile stolon has become the axial tube. That the latter can assume its original character again is shown by the fact that the axial tube sometimes terminates as a stolon. The minute space which intervenes between the perisarc of the adnate hydrotheca and that of the axial tube at the base of the inner wall of the former, and the distinctness of the two skeletal layers, even where they are adnate, points also to the essential distinctness of hydrotheca and axial tube.

It would appear, then, that *Cryptolaria* has arisen from a simple *Lafoëa*-like stock by the union of a hydrorhizal tube along a hydrotheca to which it just has given rise—somewhat after the manner of the development of the rhizocaulon of *Lafoëa dumosa*. The regularity of the arrangement of the hydrothecæ, and of the branches and branchlets in *Cryptolaria*, points, however, to a growth less haphazard than that of the typical rhizocaulon. The close relationship between *Lafoëa* and *Cryptolaria* has already been clearly shown by the similarity of their coppinia-gonosomes; the presence in one and the same species of two forms of individuals which, found separately, would have been classified as distinct species of *Lafoëa* and of *Cryptolaria*, emphasises as markedly this relationship. Yet, although Billard has already slumped these two genera under the name of the former, I prefer at present to keep them distinct, on account of the convenience to systematists which their separation into broadly marked groups gives, rather than on account of their natural apartness.

The reasons which lead me to consider Hartlaub's *Cryptolaria conferta*? as a synonym of *C. crassicaulis* are given above in the discussion regarding *C. conferta*.

Locality.—Station 48, off Wollongong, seven to eight miles from shore; depth, 55 to 56 fathoms; bottom, sand and mud to rock; 18th March, 1898; a single colony.

Distribution.—*Cryptolaria crassicaulis* was described by Allman from specimens obtained off Ascension Island at a depth of 420 fathoms. Since then Hartlaub has described from Antarctic Seas (Lat. 70° 00' S., Long. 80° 48' W., 550 metres) under the name *Cryptolaria conferta*?, specimens which seem to me to belong to this species.

PERISIPHONIA EXSERTA (*Johnson*).(Plate lxxxvii., fig. 3; *cf.* fig. 2.)

Cryptolaria exserta, J. V. Johnson, Quart. Journ. Micro. Sci., vi., 1858, p. 130, pl. xix., figs. 3, 3a, 3b.

Perisiphonia filicula, Allman, Rep. Sci. Res. "Challenger" Exped., Zool., xxiii., 1888, Hydroida, p. 44, pl. xxii., figs. 1-4.

Station 57.

Trophosome.—A single young colony, less than 20 mm. in height, alone represents this genus. The stem is slender and polysiphonate, with a fascicle of about ten to twelve peripheral tubes. From it arise slender branches or hydroclades, lying in one plane, in sub-opposite pairs which are 2-5 mm. apart. These attain a length of 10 mm. and are slightly fascicled. At the base, one or more peripheral tubes accompany the offshoot of the axial tube from the stem, and here the hydroclade is of very small diameter; additional tubes, which arise from the hydroclade itself, strengthen the fascicle and increase the diameter in the median part, although towards the tip the number of tubes falls away again.

The hydrothecæ are borne in two opposite series on the axial tubes. They are very regularly alternate in position and are close-set, each hydrotheca overlapping the distal and the proximal portion of its predecessor and successor respectively, on the opposite side of the axial tube. They lie in one plane. The bodies of the hydrothecæ are cylindrical with a somewhat bulging profile, and lie closely adpressed to the axial tube for more than two-thirds of their length; while the terminal portion curves gently away from the stem and projects for a short distance through the fascicle of peripheral tubes. The aperture of a hydrotheca is round and lies in the same plane as the long axis of the hydroclade. Its borders are smooth and are slightly everted, and there is little tendency to regeneration of hydrotheca, for at most two reduplicated margins occur. The base of the hydrotheca passes into a slightly bulging portion of the axial tube, corresponding to a hydrothecal peduncle, and is marked by the presence of a strong diaphragm which slants from the outside inwards and downwards. There is a scarcely appreciable thickening of the exterior wall where the angle due to the outward bending of the hydrotheca occurs.

Many sarcothecæ are scattered on stem and branches. On the external peripheral tubes, they appear to be placed at fairly regular intervals; and their structure is constant. They are short, cylindrical bodies, of diameter wide as compared with their length. Each is perched on a tooth-like forward-projecting

process which arises from the peripheral tube, and which tapers to the tip, where its diameter is considerably less than that of the free portion of the sarcotheca. Often the sarcotheca is represented only by the stiff basal portion, for the distal portion is delicate and is slightly attached. *Gonosome*.—Not present.

Remarks.—I have compared this specimen with fragments of the specimens collected by the "Challenger" and named by Allman *Perisiphonia filicula* and *Perisiphonia pectinata*.²¹ There can be no doubt it is specifically identical with the former, notwithstanding discrepancies between the characters given above and Allman's description and figures. Comparison of a fragment of one of the specimens of *P. filicula* examined by Allman with his description shows that the latter is misleading. Thus, the hydrothecæ are described as "flask-shaped," with the "neck" short and stout, and in the figures they are represented as retort-shaped with a bulging proximal portion tapering upwards into a much narrower so-called "neck." In reality, the diameter of a hydrotheca is almost constant throughout, and the neck can be distinguished only because of its outward curvature. The distinction between a hydrotheca and its "peduncle" is exaggerated in the figures, for in the specimen their continuity of profile is unbroken, and only the internal diaphragm marks their junction. The sarcothecæ are misrepresented in Allman's fig. 2, for all the perfect specimens I have seen consist of a fixed process from a stem tube, surmounted by a short movable cylindrical limb. Again, in Allman's figures, a sarcotheca springs from the axial tube immediately beneath each hydrotheca, but I find no trace of such a sarcotheca. These modifications show that no difference of import exists between Allman's *P. filicula* and the "Thetis" specimen—that their dimensions are also in close correspondence a glance at the following table will show.

Regarding the identity of *P. filicula*, Allman, and *P. pectinata*, Allman, which Pictet and Bedot have urged, there is more room for doubt. The fragment of the type specimen of *P. pectinata*²² which I have examined differs from *P. filicula* in respect of the greater distance which separates the hydrothecæ; the greater length and slenderness of their free portions; the sharp angle at which they bend away from the stem, and which is indicated on the abcauline wall by an internal thickening of chitin; the greater length of the sarcothecæ, which project sometimes to the height of the hydrothecæ, and which are less distinctly, or not at

²¹ Allman—Rep. Sci. Res. "Challenger," Zool., xxiii., 1888, Hydroida, p. 45, pl. xxi., figs. 2, 2a, 2b.

²² See Plate lxxxvii., fig. 2.

all, divided into a fixed peduncular, and a free terminal portion. In *P. pectinata*, also, regeneration has occurred in the hydrothecæ and sarcothecæ much more abundantly than in *P. filicula*, for in the former hydrothecæ occur each with as many as thirteen successive margins.

In view of these differences, and in spite of the odd variations described by Pictet and Bedot,²³ I cannot agree to the union of Allman's two species until forms more definitely intermediate are found.

Dimensions in mm. :—

Organs.	"Thetis" specimens.	Allman's type of <i>Perisiphonia filicula</i> .	Allman's type of <i>Perisiphonia pectinata</i> .
Peripheral tube, diameter...	0·05-0·06	0·045-0·07	0·055
Hydrotheca, length adnate to axial tube	0·33-0·36	0·38	0·36-0·38
Hydrotheca, length free from axial tube	0·13-0·17	0·14	0·31-0·32 ²⁴ 0·15-0·19
Hydrotheca, diameter at mouth	0·111-0·123	0·117-0·144	0·084-0·099
Sarcotheca, length ²⁵	0·07-0·10	0·055-0·12	0·15-0·28 ²⁴ 0·12-0·10
Sarcotheca, diameter	0·027	0·027-0·030	0·024-0·027
Distance between adjacent hydrothecæ on hydroclades ²⁶	0·46-0·49	0·39-0·44	0·62-0·66

P. filicula I regard as a synonym of Johnson's *Cryptolaria exserta*, of which characteristic figures are given by that author, fig. 3*b* exhibiting unmistakably the presence of nematophores. The latter name is prior in time.

Regarding the relationships of similar forms described by other authors, it is impossible to decide. The general appearances of the colonies described as *P. pectinata* by Pictet and

²³ Pictet and Bedot—Res. Camp. Sci. Monaco, fasc. xviii., 1900, Hydraires, p. 20.

²⁴ The numerator gives the total length of a hydrotheca or sarcotheca including reduplicated margins, the denominator, the length of the *primary* hydrotheca or sarcotheca in the same series.

²⁵ From the surface of the peripheral tube to the tip.

²⁶ Measured from any point of one hydrotheca to the corresponding point of that next to it on the same side of the axial tube.

Bedot²⁷ and *P. chazaliei* by Clarke²⁸ seem to me to indicate *P. flicula*, while the original *P. chazaliei* as described by Versluys²⁹ resembles, on the other hand, Allman's *P. pectinata*.

Localities.—Station 57, off Wata Mooli, three and a half to four miles from shore; depth, 59 to 54 fathoms; bottom, mud; 22nd March, 1898.

Family SERTULARIDÆ.

SERTULARELLA ADPRESSA,³⁰ *sp. nov.*

(Plate lxxxv., fig 5; Plate lxxxviii., figs. 1, 2, and 9.)

Stations 36 and 54.

From each of two Stations comes a single example of this species. That from Station 54 is the larger and more mature colony and its growth is more complex.

Trophosome.—The habit of the colony is striking. The stems, stout (up to 3 mm. in diameter), and strongly fascicled, spring from a clump of hydrorhizal tubes, and bear irregularly arranged, long, fascicled branches, the first of which may arise quite near the base of the colony. The branches reach a length of 6 cms., and bear branches, which again carry branches, and these again, to the fourth degree. Stem and branches are furnished with regularly arranged, alternate pinnæ, up to 18 mm. in length, although the general size is about 10 mm. Two pinnæ on the same side are separated by slightly under 3 mm. Branches and pinnæ lie in one plane, and so frequent is anastomosis between branch and stem, and pinna and branch, that a colony may be bound into a flabelliform mass, and even two or more colonies may become inseparably united. Formed in this way, the largest specimen before me forms an expanse 10 cm. high by 9 cm. broad.

Where it is free from fascicle tubes, the stem can be seen to be divided into regular internodes separated by oblique nodes which slope successively in opposite directions. Each internode bears three hydrothecæ, following each other in a close succession, which is seldom interrupted by nodes. Indeed, in the majority of the pinnæ, there is no trace of division into internodes.

²⁷ Pictet and Bedot—Res. Camp. Sci. Monaco, fasc. xviii., 1900, p. 18, pl. iv., figs. 1-4, pl. v.

²⁸ Clarke—Mem. Mus. Comp. Zool. Harvard, xxxv., 1, 1907, p. 15, pls. 11-13.

²⁹ Versluys—Mem. Soc. Zool. France, xii., 1899, p. 32, figs. 2-4.

³⁰ *ad*, and *premo*, to press, signifying the addressed condition of the gonangium.

The hydrothecæ are tubular, gradually bending outwards. Their adcauline wall is altogether adnate to the pinna, except for a distal moiety, comprising little more than the adcauline tooth. Exceptionally, a slightly larger portion is free, and this generally on the stem. Also where several regenerated margins have succeeded each other within the old margin, as often happens, it appears as if a larger portion were free; but, as a rule, there is little variation, virtually the entire adcauline wall of any primary hydrotheca being adnate. The margin of the hydrotheca is divided into three equal and equidistant teeth, one adcauline, central and projecting, the others forming an abcauline lateral pair, which scarcely project beyond the line of the abcauline wall. The teeth are separated by deep embayments. The operculum has three flaps. The hydrothecal walls are strongly developed; the abcauline terminates at the aperture in a knob of chitin, and the cavity of the hydrotheca is cut off from that of the stem by a horizontal base, from the inner corner of which very short chitinous supports project downwards.

The soft parts are poorly preserved, but these points were distinguished:—A single tube of cœnosarc runs throughout the colony, and from it the hydranths are given off on short branches. The hydranths, which enter through the anterior half of the base of a hydrotheca, have about fifteen tentacles, and possess a small blind-sac, from which proceeds a protractor muscle attached to the distal half of the abcauline wall.

Gonosome.—The gonangia are borne on stem, branches, or pinnae, but are most common on the last. They arise from the anterior of these, immediately beneath a hydrotheca, and lie so closely against the pinna that the adcauline portion of the gonangium becomes hollowed to fit it, as in the case of *Theocladium flabellum*, Allman, while the margins of the gonangium show more intimate adaptation to the outlines of hydrothecæ and internode. The profile is very different as seen in frontal and lateral aspects (*cf.*, Plate lxxxviii., figs. 1 and 2). No distinct stalk is present, and in the former view they appear as much elongated (length three times maximum breadth), slightly club-shaped bodies, with a small circular aperture which lies a little within the upper margin and faces the observer. In lateral aspect, the profile is wedge-shaped, for the gonangium widens gradually towards the summit, the adcauline distal edge being produced in a short angle along the stem, while the abcauline edge is replaced by the aperture, termino-lateral in position, facing upwards and outwards, placed upon a short narrow tube with trumpet-shaped lip, the tube set in a shallow depression of the gonangium wall. Faint traces of annulation sometimes occur, especially on the distal half of the gonangium. In the cases where the preserva-

tion of the cœnosarc permitted discrimination to be made, the gonangia were found to contain large ova, about five in number.

Dimensions.—

Stem internode, greatest length.....	1.22-1.36 mm.
Pinna, diameter	0.42 mm.
Hydrotheca, length.....	0.39 mm.
Hydrotheca, diameter	0.16-0.18 mm.
Gonangium, length	2 mm.
Gonangium, greatest breadth (frontal aspect) ...	0.64-0.73 mm.
Gonangium, greatest breadth (lateral aspect) ...	0.52-0.63 mm.

Affinities.—This species, which belongs to the Johnstoni-group of Hartlaub, seems to be most closely allied to *Sertularella pluma*, Hartlaub, but from that it may be distinguished by the greater length of its pinnæ (at least twice as long); by the presence of a pinna on each internode, by the wider angle at which the pinnæ are set, and especially by the shape and habit of the gonangium.

There is much superficial resemblance also to *Sertularella subarticulata* (Coughtrey), an undoubted *Sertularella*, hitherto referred to *Thuiaria* by authors. In this case, however, Coughtrey, Allman (who described the species under the name *Thuiaria bidens*), and Bale, each describe the hydrothecæ as having two adcauline teeth, although the last adds that "it is often difficult to distinguish more than one tooth on the inner side."³¹

In *Sertularella adpressa*, the single adcauline tooth is unmistakable and invariable. There are great differences between these species, also, in the structure and habit of the gonangium.

Localities.—Station 36, off Botany Bay, one mile from shore; depth, 23 to 20 fathoms; bottom, sand to rock; 11th March, 1898; young colony without gonangia. Station 54, within Jervis Bay; depth, 10 to 11 fathoms; bottom, seaweed and sand; 20th March, 1898; large colony with gonangia.

Type Specimens.—In the Australian Museum, Sydney.

SERTULARELLA DIVARICATA (*Busk*),

var. SUBDICHOTOMA, *Bale*.

Sertularella subdichotoma, Kirchenpauer (*in parte*), Abh. Nat. Ver. Hamburg, viii., p. 46 (*vide* Hartlaub, 1900, p. 33).

³¹ Bale—Proc. Linn. Soc. N.S. Wales, (2), iii., 1888, p. 746.

Sertularella divaricata, var. *subdichotoma*, Bale, Proc. Linn. Soc. N. S. Wales, (2), iii., 1888, p. 761, pl. xvi., figs. 3, 4. *Id.*, Hartlaub, Abh. Nat. Ver. Hamburg, xvi., 1900, p. 23.

Station 44.

A minute fragment, only about 3 cms. long, shows the characteristic lax and irregular branching, and the other structural details of Bale's variety. Scarcity of material, and the absence of gonangia, alike forbid speculation as to the possibility of identity between this Australian variety and the South American and Antarctic *Sertularella subdichotoma*, Kirchenpauer, excellently and minutely described and figured by Hartlaub (1900).

Dimensions.—

Internode, length.....	0.43-0.63 mm.
Hydrotheca, length adnate.....	0.14-0.20 "
" " free.....	0.11-0.15 "
" diameter at mouth...	0.14-0.16 "

Locality.—Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898.

This variety has previously been recorded only from Port Jackson (Bale), and Bass Strait (Kirchenpauer).

SERTULARELLA LONGITHECA, Bale, *typica*.

(Plate lxxxviii., fig. 7.)

Sertularella longithecæ, Bale, Proc. Linn. Soc. N. S. Wales, (2), iii., 1888, p. 762, pl. xvi., figs. 5, 6. Bale, Trans. Roy. Soc. Vict. (n.s.), vi., 1894, p. 101, p. iv., figs. 7-9. Hartlaub, Abh. Nat. Ver. Hamburg, xvi., 1900, p. 21.

Station 57.

A few diminutive but typical examples of this species were found at only one Station. They form delicate, straggling, unbranched stems up to 30 mm. in length. Bale's figures are characteristic, the most marked features of the trophosome of the species being the length of the hydrothecæ, associated with their small calibre, regularly tubular shape, and the large proportion which is free from the stem. The specimens before me rarely show definite nodes between hydrothecæ, and in distinction from the variety following, the stem is straight, showing no signs of geniculation.

The significant measurements of the trophosome agree fairly closely with calculations made from Bale's figures, except that in the present specimens a larger proportion of the hydrotheca is free from the stem. *Gonosome* not present.

Dimensions.—

Organs.	Present specimens.	Bale's Figures.
Stem, diameter	0·73-1·47 mm.	0·47-0·60 mm.
Distance between hydrothecæ	0·18-0·21 „	0·25 mm.
Hydrotheca, length adnate	0·29-0·41 „	0·37-0·40 mm.
„ „ free	0·36-0·42 „	0·25-0·32 „
„ „ diameter at mouth	0·17 mm.	0·17-0·20 „

Locality.—Station 57, off Wata Mooli, three and a half to four miles off shore; depth, 59 to 54 fathoms; bottom, mud; 22nd March, 1898.

Sertularella longithecæ has hitherto been found only at Port Denison (Bale, 1888), and Port Phillip (Bale, 1894).

SERTULARELLA LONGITHECA, *Bale*,

var. ROBUSTA, var. nov.

(Plate lxxxviii., fig. 8.)

Stations 36, 44, and 48.

Specimens from two Stations appear to belong to a variety of the above species. They occur in short monosiphonic colonies, only about 3 cm. in height, lax in growth, with rare and irregular branches which spring, with a long internode, from directly beneath a hydrotheca, and which are similar to the longer "stem." In the older portions of the colonies, owing to the great thickness of the perisarc, the nodes become obscured, although a slight constriction immediately distal to a hydrotheca generally indicates their position. The internodes do not lie in a straight line, as in Bale's figure (1888, pl. xvi., fig. 5), but are zig-zag, bending to one side and the other in gentle curves which follow the inner lines of the hydrothecæ.

The hydrothecæ lie towards the distal ends of the internodes, and are remarkable for their great depth and for the length of the adnate portion. They are not quite tubular, as in the typical form, but reach a maximum diameter at the point where they become free, tapering slightly downwards until they end in a rounded base, and less markedly towards the mouth. Many show indications of a faint rugosity on the free adcauline wall. There is some variation in the proportion of the adnate part of the hydrotheca. In no case has so small a portion as a third been observed, although such occurs in the typical form; for the

proportion is generally over a half, and almost as much as two-thirds may be adnate. In these specimens, also, the three hydrothecal teeth are less prominent than in Bale's figure of the typical examples.

None of the characteristic gonangia were present, but in spite of this, and of the divergences from typical specimens, which I have noted above, I do not hesitate to regard these as belonging to a form of *Sertularella longitheca*.

The following measurements show that the hydrothecæ are much larger than those of the typical form; the whole growth is coarser, and to this is due the varietal name *robusta*.

Dimensions.—

Internode, length.....	0.75-0.94 mm.
" diameter.....	0.22-0.29 "
Hydrotheca, length adnate	0.57-0.66 "
" " free... ..	0.38-0.43 "
" diameter at mouth ...	0.28-0.32 "

Localities.—Station 36, off Botany Bay, one mile from shore; 23 to 20 fathoms; bottom, sand to rock; 11th March, 1898; a few small colonies. A single small fragment was observed intertwined with Polyzoa colonies from Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898. Station 48, off Wollongong, seven to eight miles from shore; depth, 55 to 56 fathoms; bottom, sand and mud to rock; 18th March, 1898; several colonies growing on submerged débris.

Type Specimens of variety.—In the Australian Museum, Sydney.

SERTULARELLA TURGIDA (*Trask*)?

(Plate lxxxviii., fig. 6.)

Sertularia turgida, Trask, Proc. Calif. Acad. Sci., i., 1854-57, p. 113, pl. iv., fig. 1.

Sertularella turgida, Clarke, Trans. Conn. Acad., iii., 1876, p. 259, pl. xxxviii., figs. 4, 5. *Id.*, Hartlaub, Abh. Nat. Ver. Hamburg, xvi., 1900, p. 67, pl. 2, fig. 30, pl. 3, figs. 21, 22, text-figs. *Id.*, Torrey, Univ. California Publ., Zool., i., 1902, p. 64, pl. 7, figs. 59-62, pl. 8, figs. 63-69. *Id.*, Nutting, American Hydroids, Part ii. The Sertularidæ, Spec. Bull. U.S. Nat. Mus., 1904, p. 95, pl. 22, figs. 2-5. *Id.*, Torrey, Univ. California Publ., Zool., ii., 1904, p. 29, figs. 22, 23.

Sertularella conica, Calkins, Proc. Boston Soc. Nat. Hist., xxviii., 1899, p. 359, pl. 4, fig. 22.

Sertularella nodulosa, Calkins, *Loc. cit.*, p. 360, pl. 5, fig. 29.

Station 57.

With hesitation I refer two minute colonies to this species. The larger consists of a hydrorhizal tube from which a stem, 11 mm. high, springs. The stem is slightly geniculated and is divided into long slender internodes, at the distal end of each of which a hydrotheca is borne. The hydrothecæ resemble those of *Sertularella polyzonias* in general shape, but they have only three marginal teeth. The salient characters may be summarised thus:—Hydrothecæ adnate for less than one half of their length to the stem, the free portion being strongly exerted, projecting from the stem abruptly almost at a right angle, and narrowing to the orifice. The abcauline wall is straight, and occasionally slightly waved, but the adcauline is marked by several definite undulations. The apertures are obscured by the presence of very many reduplicated margins, but they show that the hydrothecæ are furnished with three teeth and that intrathecal teeth are absent.

In all these respects our specimen agrees with Hartlaub's description, and it also bears close resemblance to the figure given by him (1901, pl. iii., fig. 21) of a specimen from Bare Island, Vancouver; and to that given by Nutting (1904, pl. xxii., fig. 3).

The greater length of the internodes and the straighter profile of the hydrothecæ in our specimens bring them into line with a Japanese specimen described by Nutting (1901, p. 95).

It seems legitimate, therefore, to consider that our specimens fall within the bounds of a species which is "by far the most variable on the [Californian] coast" (Torrey, 1904, p. 29), although, owing to the absence of the gonotheca, which is characteristic, absolute identification is inadvisable.

Dimensions.—

Stem, diameter.....	0.18-0.21 mm.
Length between hydrothecæ	1.20-1.41 "
Hydrotheca, length free	0.36-0.49 "
" " adnate	0.32-0.38 "
" diameter at mouth ...	0.18-0.22 "

Locality.—Station 57, off Wata Mooli, three and a half to four miles from shore, 59 to 56 fathoms; bottom, mud; 22nd March, 1898.

The species is new to Australian seas. It has hitherto been recorded only from the Pacific Coast of North America—from

the neighbourhood of San Diego to the neighbourhood of Queen Charlotte Islands on the coast of British Columbia; and a single specimen was found at "Albatross" Station 3775, "off Japan."

THUIARIA SINUOSA, *Bale*.

(Plate lxxxv., fig. 4.)

Thuiaria sinuosa, Bale, Proc. Linn. Soc. N. S. Wales, (2), iii., 1888, p. 772, pl. xviii., figs. 9, 10.

Station 54.

This species does not seem to have been referred to since Bale published his original description from "a small piece taken from a specimen in the Museum, which is about two inches high, and incomplete." The present specimens give a better idea of the mature growth of the species, for the largest is 125 mm. long, with a straight stem, fasciated to within 25 mm. of the tip, 2 mm. in diameter at the base, and gradually tapering upwards. Although the majority of the colonies are simple, the largest bears, 4 mm. from the base, a strong branch in all respects similar to the stem, while another fragment bears three branches, from one of which spring similar branches of second degree.

Occasionally, some of the lower pinnæ show a special development, for the hydrothecæ disappear, and the central tube is continued as a stolon-like process. The utility of such a development is manifest where the modified pinnæ actually come to function as stolons which, attached to a substratum, give rise to new and practically independent colonies (Pl. lxxxv., fig. 4). This phenomenon in *Thuiaria sinuosa* corresponds to the production of "rameaux stoloniques," a vegetative process adopted as a subsidiary mode of reproduction by many Hydroid species.³²

Gonangia are present on several of the colonies.

Dimensions.—

Stem, diameter of cladate tube (including hydrothecæ)	0·56 mm.
Pinna, length	up to 25 "
" diameter (including hydrothecæ)	0·46-0·56 "
Hydrotheca, length	0·47-0·56 "
" greatest diameter	0·12-0·15 "
Gonangium, length	1·5 "
" greatest diameter ..	0·67-0·74 "

Locality.—Station 54, within Jervis Bay; depth, 10 to 11 fathoms; bottom, seaweed and sand; 20th March, 1898. Hitherto recorded only from Port Molle, Queensland.

³² See Billard—Ann. Sci. Nat., Zool., (8), xx., p. 12, *et seq.*

SERTULARIA ELONGATA, *Lamouroux*.

Sertularia elongata, Lamouroux, Hist. Polyp. Corral. flexibles, 1816, p. 189, pl. v., figs. 3a, B, C. *Id.*, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 75, pl. vi., figs. 7, 8, pl. xix., fig. 7. *Id.*, Billard, Ann. Sci. Nat., (9), vi., 1907, p. 217, fig. 2.

Sertularia millefolium, Lamarck, Hist. nat. Anim. sans Vertèbres, 1816, p. 116.

Sertularia lycopodium, Lamarck, *Ibid.*, p. 117.

Sertularia scandens, Lamouroux, *Op. cit.*, p. 189.

Dynamene abietinoides, Gray in Dieffenbach, Travels in New Zealand, 1843, ii., p. 294.

Sertularia abietinoides, Coughtrey, Trans. N. Zeal. Inst., vii., 1875, p. 285, pl. xx., figs. 16, 18-20.

Station 40.

Recorders agree in ascribing a wide range of variability to this characteristically Australian species. The present specimens, colonies 4 to 5 cms. long, with pinnæ averaging about 5 mm., are notable for the robustness of their minute structures—the strength of the hydrothecal teeth, and the great thickness of the hydrothecal walls in the free adcauline portion, being especially noticeable. Yet the hydrothecæ are much smaller in size than the average.

Dimensions.—

Stem, length of internode	0.68-0.73 mm.
Hydrotheca, length of external profile	0.25-0.29 "
" " " adnate portion	0.21-0.32 "
" diameter	0.11-0.14 "
" thickness of abcauline wall	15-21 μ .
" " " free adcauline wall ...	15-21 μ .
Gongium, length	up to 2 mm.
" maximum diameter.....	0.77-0.99 mm.

Locality.—A small clump of colonies from Station 40, off Wata Mooli, three miles from shore; depth, 52 fathoms; bottom, sand and boulders; 12th March, 1898.

SERTULARIA MINIMA, *Thompson*.

Synthecium gracilis, Coughtrey, Trans. N.Z. Inst., vii., 1875, p. 186, pl. xx., figs. 26-31 (name preoccupied).

Sertularia pumila, Coughtrey, Trans. N.Z. Inst., viii., 1876, p. 301, and Ann. Mag. Nat. Hist., (4), xvii., 1876, p. 29.

- Sertularia minima*, Thompson, Ann. Mag. Nat. Hist., (5), iii., 1879, p. 104, pl. xvii., figs. 3, 3a, 3b. *Id.*, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 89, pl. iv., figs. 9, 10, pl. xix., figs. 12, 13. *Id.*, Allman, Journ. Linn. Soc., Zool., xix., 1886, p. 138, pl. xiii., figs. 3, 4. *Id.*, Etheridge, Austr. Mus. Mem., No. 2, 1889, p. 41. *Id.*, Marktanner-Turneretscher, Ann. k.k. Hof.-Mus. Wien., v., 1890, p. 231. *Id.*, Thornely, Journ. Linn. Soc., Zool., xxxi., 1908, p. 83.
- Sertularia pumiloides*, Bale, Journ. Micro. Soc. Vict., ii., 1882, p. 21, pl. xii., fig. 2.

Stations 34, 36.

Trophosome.—The present specimens of this species differ from typical forms in the greater elongation of their internodes, and in the obscurity of the stem nodes, particularly on the lower portion of a stem. They thus come to resemble *Sertularia distans*, a species to which they are apparently very closely related; but the distinguishing points are to be found in the robustness of build of *Sertularia minima*, the marginal teeth being especially long and strong; in the comparatively large proportion of the hydrotheca which is adnate to the stem, the small proportion which is free; and in the small proportion of a hydrotheca-pair which is contingent in front of the stem.

Coughtrey, Bale, and Allman refer to transverse markings in the hydrothiza. They are here well developed in the colonies from both Stations, consisting of ribs of chitin which run vertically up the sides of the tubes at irregular intervals, and project across the cavity of the tube for about a quarter of its breadth. Viewed from above, they appear as piers of chitin running out from the lateral walls and terminating in a hammer-headed knob. Such a type of supporting structure is by no means of definite specific value, however, for in my own experience they occur in the hydrorhizal tubes of species so widely separated as *Podocoryne anechinata*,³³ *Sertularia heterodonta*,³⁴ and *Plumularia lagenifera*, var. *septifera*;³⁵ while Warren has described them as characteristic of *Pasythea quadridentata*,³⁶ and Bale (1884, p. 90) says they occur in many species of *Plumularia*. It is apparent that such strengthening ribs are analogous developments in very diverse forms, perhaps induced, as I have suggested, where the

³³ Ritchie—Proc. Zool. Soc., 1907, p. 499, pl. 23, fig. 10.

³⁴ Ritchie—Trans. Roy. Soc. Edinb., xlvi., 1909, p. 79.

³⁵ Ritchie—*Ibid.*, p. 88, fig. 7b.

³⁶ Warren—Ann. Natal Gov. Mus., i., 1908, p. 313, fig. 11.

Hydrorhizal tubes are subjected to unusual buffeting and rough usage owing to wave action or other causes.

Gonosome.—Gonangia are present on several of the colonies.

Dimensions.—

Total height	up to 9 mm.
Stem internode, length	0.45-0.53 mm.
" " diameter at base of hydrotheca	0.15 mm.
Hydrotheca, ³⁷ length of external profile	0.31 "
" " length of free portion.....	0.17-0.20 mm.
" " of adnate portion.....	0.25-0.28 "
" " diameter at mouth.....	0.07-0.09 "
Gonangium, length	1.09-1.15 "
" " maximum diameter.....	0.75-0.82 "

Localities.—Station 34, off Port Jackson, three and a half to two and a half miles from shore; depth, 39 to 36 fathoms; bottom, sand and mud; 10th March, 1898; not common, growing on a Polyzoon. Station 36, off Botany Bay, one mile from shore; depth, 23 to 20 fathoms; bottom, sand to rock; 11th March, 1898; in clusters on foreign objects.

SYNTHECIUM CYLINDRICUM (*Bale*).

Sertularella cylindrica, Bale, Proc. Linn. Soc. N. S. Wales, (2), iii., 1888, p. 765, pl. xvi., fig. 7.

Var.—*Sertularella cylindrica*, var. *pusilla*, Ritchie, Proc. Zool. Soc., 1910, p. 817, pl. lxvii., fig. 9.

Sertularella halecina, Torrey, Univ. California Publ., Zool., i., 1902, p. 61, pl. v., fig. 55, pl. vi., fig. 56.

Synthecium cylindricum, Nutting, American Hydroids, Pt. ii., 1904, p. 136, pl. xli., fig. 7.

Stations 44 and 48.

The occurrence of many colonies in this collection allows of the addition of several details, especially as regards variation, to the description of Bale, and to my recent notes on diminutive Indian Ocean specimens. Most striking, on first examination, is the evil condition of the colonies, for the hydrothecæ, having extremely thin walls, have almost all collapsed, and many have been wrenched from their places.

Trophosome.—A creeping hydrorhizal tube ramifies over a branched Isid Alcyonarian, and anastomoses with neighbouring tubes, thus forming an entangled mesh-work. From this, at

³⁷ Measurements taken to tip of teeth.

irregular intervals, the unfasciated stems of the colonies arise reaching occasionally a height of 53 mm., and averaging between 30 and 40 mm. The stem is almost straight and generally bears short, irregularly-set (never opposite) branches, which leave it at a wide angle, lie in one plane, and themselves bear branchlets to the second degree. It is built of very thick perisarc, and although not divided into internodes with the regularity which Bale suggests, it bears hydrothecæ, and is marked by occasional deep constrictions. The branches, although, as a rule, they are short and simple, occasionally reach a length of 20 mm., and bear offshoots of second degree. They arise from the stems at a point proximal to a hydrotheca, and a little to one side. The branches are not in general divided into regular internodes, but the interthecal portions widen considerably from below upwards so that each hydrotheca appears to rest on a bracket.

From one to four hydrothecæ occur between successive nodes, but they are not separated by equal distances, for, almost a millimetre apart at one place, at another they are so close that the base of one is opposite the adnate portion of its predecessor. The hydrothecæ are "large, stout, cylindrical, smooth, usually somewhat rounded at the base, curved outwards," and in all respects agree with Bale's figure and description, except as regards the proportion attached to the internode. In Bale's specimens, they are "adnate nearly half their height," while in the present specimens only one-third of the total height is attached. This is due chiefly to the greater length of the free portion, the actual length attached being almost equal in both cases. I refer again to the great tenuity and delicacy of the walls of the hydrothecæ and to their consequent poor state of preservation.

Gonosome.—Not present.

Dimensions.—

Hydrorhiza, diameter	0.38 mm.
Stem, diameter.....	up to 0.39 mm.
Hydrotheca, total length ³⁸	0.80-0.84 mm.
,, length adnate.....	0.27-0.32 mm.
,, diameter at mouth.....	0.32 mm.
Distance between corresponding points of successive hydrothecæ	0.26-0.98 mm.

The above measurements agree closely with those deduced from Bale's figure, but they are very much larger than those of the examples I have recorded from the Mergui Archipelago as *Sertu-*

³⁸ Primary hydrothecæ were measured; the rim of a secondary hydrotheca may increase the length by about 0.1 mm.

Sarella cylindrica, var. *pusilla*. They show, moreover, that the proportions of *Synthecium alternans*, Allman, (in which more than half of the hydrotheca is adnate) differ very markedly from those of *S. cylindricum*.³⁹ Add to this the dissimilarity between the habits of these two species. *S. alternans* is, according to Allman,⁴⁰ "a strong, rather rigid form, with the stem fascicled towards the base, set with pinnately-disposed, equidistant, alternate ramuli," which, in his figure are unbranched; while *S. cylindricum* is a somewhat lax form with unfascicled stem, with branches which are irregularly set, not equidistant, and not necessarily alternate, and which are themselves sometimes branched. Consideration of these differences convinces me that Billard (*loc. cit.*) has erred in regarding *S. cylindricum* as a synonym of *S. alternans*.

Localities.—Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898; many colonies. Station 48, off Wollongong, seven to eight miles from shore; depth, 55 to 56 fathoms; bottom, sand and mud to rock; 18th March, 1898; few small colonies.

In addition to the Port Jackson records of Bale, and those other Australian records given above, this species has been found in San Diego Bay, California, whence it has been described by Torrey as *Sertularella halecina*.

SYNTHECIUM ORTHOGONIUM (*Busk*).

Sertularia orthogonia, Busk, Voy. "Rattlesnake," i., 1852, p. 390.

Id., Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 88, pl. ix., fig. 11.

Synthecium orthogonia, Bale, Proc. Linn. Soc. N. S. Wales, (2), iii., 1888, p. 767, pl. xvii., figs. 1-5.

Synthecium orthogonium, Kirkpatrick, Sci. Proc. Roy. Dublin Soc. (n.s.), vi., 1890, p. 604. *Id.*, Billard, Ann. Sci. Nat., Zool. (n.s.), xi., 1910, p. 25.

Stations 10, 36, 54, and 57.

Examples of this species come from four Stations, those from Stations 36 and 54 being the more typical in appearance, and resembling Bale's figure (1888, pl. xvii., fig. 1), while those from

³⁹ Cf. the above measurements with those of *S. alternans* type, given by Billard—Ann. Sci. Nat., Zool., (n.s.), xi., 1910, p. 27.

⁴⁰ Allman—Rep. Sci. Res. "Challenger," Zool., xxiii., 1888, Hydroida, Pt. ii., p. 80.

Station 10 more closely resemble *Syntheceum patulum*, for the adnate portion of the hydrotheca is longer, the aperture faces upwards as well as outwards, is highly sinuous at the sides, and is seldom reduplicated. I cannot consider those specimens as belonging to distinct species, however, for the apertures of the primary hydrotheca (*i.e.*, the hydrotheca first formed, before reduplication of the margin has commenced) face upwards and their margins are slightly sinuous even in the more typical forms. Nor do the measurements of the two forms collected by the "Thetis" justify separation, for in each there is a wide range of variability. I do not feel assured, however, that the *patulum*-like form in this collection is identical with *Syntheceum patulum* (Busk); hence I refrain from adding that name to the list of synonyms. No gonangia are present.

Dimensions.—

Organs.	Specimens from Station 10.	Specimens from Station 54.
Distance between branches	2.5 4 mm.	3-4 mm.
Branch internode, length	0.80-0.96 mm.	0.72-0.74 mm.
Hydrotheca, length adnate.....	0.57-0.67 "	0.43-0.60 "
" " free.....	{ ⁴¹ 0.14-0.18 "	0.14-0.18 "
" diameter of lower portion	0.22-0.29 "	0.15-0.18 "
" diameter of mouth.....	0.16-0.18 "	0.14-0.22 "
" " ".....	0.13-0.19 "	0.14-0.22 "

These measurements do not agree very closely with Billard's measurements of Busk's type specimens.

Localities.—Station 10, two to four and a half miles off Broken Head; depth, 28 fathoms; bottom, fine sand; 22nd February, 1898; many poor colonies. Station 36, one mile off Botany Bay; depth, 23 to 20 fathoms; bottom, sand to rock; 11th March, 1898; few fragments. Station 54, Jervis Bay (within); depth, 10 to 11 fathoms; bottom, seaweed and sand; 20th March, 1898; several colonies. Station 57, three and a half to four miles off Wati Mooli; depth, 59 to 54 fathoms; bottom, all mud; 22nd March, 1898; fragments.

DIPHASIA SUB-CARINATA (*Busk*).

Sertularia sub-carinata, Busk, Voy. "Rattlesnake," i., 1852, p. 390.

⁴¹ Primary hydrotheca, *i.e.*, excluding the reduplications.

Diphasia sub-carinata, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 102, pl. iv., fig. 1, pl. xix., fig. 18. *Id.*, Kirkpatrick, Sci. Proc. Roy. Dublin Soc. (n.s.), vi., 1890, p. 604.

Station 54.

The following observations supplement the accounts of Busk and Bale. The hydrothecate lower portion of the stem is separated from the node-bearing portion by an articulation very oblique in lateral view, and resembling from the front two cones, the points of which interpenetrate. This type of node prevails throughout the colonies, but in the older portion of the stems age has obliterated the definiteness of the structure. In the hydrotheca, there is a very marked thickening of the abcauline wall where it bends outwards, but the inner margin of the thickening is smoothly rounded and is not produced into a fine ridge as in several species. The lateral ridge, on account of which the species has obtained its name, is due to a compression of the free portion of the hydrotheca from above downwards, and while apparent both on the anterior and posterior of the free part of the hydrotheca, it cannot, in these specimens, be detected in the adnate portion. The general resemblance in structure between this species and *Diphasia tetraglochina*, Billard, is very marked, but a comparison of dimensions further emphasises the distinctness which Billard⁴² records. No trace of gonosome is present.

Dimensions.—

Height of colony	up to 17 mm.
Internode, length.....	0·74-0·80 mm.
Hydrotheca, length adnate.....	0·49-0·52 "
" " free ⁴³	0·33-0·36 "
" diameter of lower portion	0·12-0·15 "
" " at mouth	0·15-0·25 "

Locality.—A small clump growing on *Thuiaria sinuosa* from Station 54, within Jervis Bay; depth, 10 to 11 fathoms; bottom, seaweed and sand; 20th March, 1898.

The species has been recorded only from Australian waters, from Torres Strait to Bass Strait, at depths varying from 5½ to 45 fathoms.

Family PLUMULARIDÆ.

PLUMULARIA SETACEA (*Linnaeus*).

Sertularia setacea, Linnaeus, Syst. Nat., Ed. 10, 1758, p. 813.

⁴² Billard—Arch. Zool. exper. (4), 1907, vii., pp. 358, 359.

⁴³ To tip of lateral tooth.

Plumularia setacea, Lamarck, Hist. nat. Animaux sans Vertèbres, ii., 1816, p. 129. *Id.*, Hincks, Hist. Brit. Hydroid Zoophytes, 1868, p. 296, pl. lxvi., fig. 1. *Id.*, Bale, Proc. Linn. Soc. N. S. Wales (2), iii., p. 778, pl. xx., figs. 14-18. *Id.*, Billard, Exp. Sci. "Travailleur" et "Talisman," viii., 1907, p. 209.

Plumularia tripartita, von Lendenfeld, Proc. Linn. Soc. N. S. Wales, ix., 1885, p. 477, pl. xii., figs. 8-10.

A single broken stem of this widely-distributed species was found entangled amongst Polyzoa. The example is notable for its grace and delicacy, this being due to the extraordinary length and relative slenderness especially of the stem-internodes, but also of the hydrotheca-bearing hydroclade internodes. The dimensions given below show that in these respects the Australian specimens even exceed that of the elongate variety obtained by the "Travailleur" near the Strait of Gibraltar.⁴⁴ No gonangia were present.

Dimensions.—

Stem internode, length	0.52-1.03 mm.
" " diameter	0.08-0.13 "
Hydroclade internode, hydrothecate, length.....	0.47-0.52 "
" " intermediate, "	0.31-0.32 "
" " " diameter ...	0.05 "
Hydrotheca, depth	0.08-0.10 "
" diameter at mouth.....	0.10-0.12 "

Locality.—Within Jervis Bay; depth, 10 to 11 fathoms; bottom, seaweed and sand; 20th March, 1898.

Plumularia setacea has already been recorded from Australia—Port Phillip, Victoria (von Lendenfeld), Port Phillip Heads (Bale).

PLUMULARIA SULCATA, Lamarck.

(Plate lxxxiv., fig. 3; Plate lxxxix., fig. 5.)

Plumularia sulcata, Lamarck, Histoire nat. Animaux sans Vertèbres, ii., 1816, p. 128. *Id.*, Billard, Ann. Sci. Nat. Zool. (9), v., 1907, p. 321.

Plumularia aglaophenoides, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 126, pl. x., fig. 6.

Station 48.

A solitary but magnificent colony represents the rare species excellently described by Bale in 1884, from a fragment two

⁴⁴ Billard—1907, p. 210.

inches long, and named by him *Plumularia aglaophenoides*. The recent examination of the original specimen in Lamarck's type collection by Dr. Armand Billard leaves no doubt that this species is identical with *Plumularia sulcata*, Lamarck, and the "Thetis" specimen agrees even more closely with Billard's description of Lamarck's type than does that of Bale. The fragmentary nature of Bale's specimen and the no less imperfect condition of the type, which is recorded as 15 or 16 centimetres long, offer excuse for a more complete description of the macroscopic aspect of the colony.

Trophosome.—The stem is polysiphonic and stout, 3.5 mm. in diameter at the base, and is straight and rigid. Although obviously incomplete, it attains a height of 28 cm. and bears four irregularly-placed branches, 2 mm. in basal diameter, the lowest of which springs from the stem 16 cm. from the base, and all of which lie in the same plane. Stem and branches are sinuous—though never sufficiently so to dispel the impression of straightness which the sturdy portions convey—and from the summit of each wave springs a primary hydroclade bearing both hydrothecæ and secondary hydroclades. The primary hydroclades thus lie in one plane, alternating in a pinnate series. Two primary hydroclades on the same side of stem or branch are distant from each other about 6.5 mm., and their length varies from 15 to 20 mm. The lax, scraggy appearance of the colony is well described by Lamarck:—"Cette espèce est maigre, lâche dans toutes ses parties. Sa tige et ses branches offrent des sillons ascendans et ondés."⁴⁵

The stem-fascicle is formed of stout tubes, each of which is armed with a series of opposite sarcothecæ, similar in structure to that which lies proximal to a hydrotheca. On the tubes which issue from the fascicle as primary hydroclades, this paired series commences proximal to the lower of the two markedly oblique joints with which the pinna originates; and here the tube is divided into a small number of internodes of irregular length. Not only does the internode included between these oblique joints bear sarcothecæ, as both Bale and Billard remark, but in the present specimen it bears a rather undersized hydrotheca, and is exactly like the succeeding thecate internodes, even giving rise, in many cases at least, to a secondary hydroclade. Occasionally hydrothecate internodes, bearing paired sarcothecæ, interrupt the hydrothecate course of the primary hydroclades.

The median sarcothecæ which lie behind a hydrotheca in the axil between it and the hydroclade are rudimentary structures,

⁴⁵ Deshayes and Milne Edwards ed. of Lamarck, ii, edition, 1836, ii., p. 164.

exceedingly delicate and hyaline, disc-like in shape, with the inner edge somewhat strengthened (Pl. lxxxix., fig. 5). Their bases are connected by means of a chitinous ridge with the upper edges of the lateral sarcothecæ. The numbers and position of the sarcothecæ vary slightly. Thus the superior pair of bithalamic sarcothecæ on a hydroclade internode may be replaced by a single median individual—a variation which I have seen present in three out of four hydrothecæ on one hydroclade. A similar variation occurs in the sarcothecæ on the proximal internode of the secondary hydroclades, and explains the divergence which Billard points to, between his own observation of two opposite sarcothecæ, and that of Bale, who mentions only one.

Dimensions.—

Hydrotheca, length	0.26-0.28 mm.
" diameter at mouth.....	0.23-0.25 "
Internode of primary hydroclades, length ⁴⁶	0.52-0.66 "
" of primary hydroclades, diameter.....	0.25-0.31 "
" of secondary hydroclades, length	0.46-0.49 "
" of secondary hydroclades, diameter ...	0.12-0.14 "

Remarks.—In spite of differences between this specimen and the descriptions by Billard and Bale, identity with *Plumularia sulcata* has been confirmed, on further examination of Lamarck's type, kindly undertaken by the former at my request. This examination, Dr. Billard informs me, reveals, as described above, the hitherto unrecorded presence of a hydrotheca on the oblique internode at the base of each pinna, and of a double series of sarcothecæ on the fascicle tubes, both of which characters had been obscured by the delapidation of the original specimen.

Locality.—Station 48, off Wollongong, seven to eight miles from shore; depth, 55 to 56 fathoms; bottom, sand and mud to rock; 18th March, 1898; a single fine colony.

Distribution.—Mers australes (Lamarck); Broughton Islands, 25 fathoms (Bale).

DIPLOCHEILUS MIRABILIS, *Allman*.

Diplocheilus mirabilis, Allman, Rep. "Challenger" Exped., vii., Hydroida, Part i., 1888, p. 49, pl. viii., figs. 4-7. *Id.*, Stechow, Abh. K. Bayer. Akad. Wissensch., 1 Suppl. Bd., 1909, p. 89.

⁴⁶ Owing to the impossibility of defining internodes in the primary hydroclades, this measurement is made from any point of a hydrotheca to the corresponding point of the next hydrotheca.

Kirchenpaueria mirabilis, Bale, Proc. Roy. Soc. Vict. (n.s.), vi., 1894, p. 109, pl. vi., figs. 4-7. *Id.*, Warren, Ann. Natal Govt. Mus., i., 1908, p. 321, fig. 15, p. 323.

Plumularia mirabilis, Billard, Ann. Sci. Nat. (n.s.), xi., 1910, p. 37.

Station 44.

Only a minute fragment of a colony represents this species. The structural details appear to fall between those of typical *Diplocheilus mirabilis* and *Diplocheilus productus* (Bale). With the latter it agrees, especially in the narrowness of the intrathecal ridge at the point where it joins the anterior wall, but this is a variable character; while the widely expanded margin of the hydrotheca shows resemblance to the former. There are generally two hydroclades on each internode, each accompanied by two close-set sarcothecæ, one in the axial above the stem-process on which the hydroclade is borne, the other at the superior interior border of the process. The only other cauline sarcotheca, the position of which approaches constancy, is that which lies close to the distal edge of an internode, in the middle of the anterior surface. The nematocysts within the stem are of large size, 15μ long, by 9μ or 10μ in diameter, but the cœnosarc, apart from these, has decayed.

Dimensions.—

Stem internode, length	0.59-1.19 mm.
" " diameter	0.15-0.17 "
Hydroclade internode, length.....	0.44-0.50 "
Hydrotheca, depth (highest point to lowest).....	0.31-0.33 "
" diameter of mouth (side view)	0.19-0.21 "

Locality.—Entangled amongst Polyzoa from Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898.

The known distribution of this species is confined to Australian waters, and to the Natal coast.—Moncoeur Island, Bass Strait (Allman), Port Phillip and Griffith Point (Bale), and present record; Scottburgh, Natal (Warren).

HALICORNOPSIS ELEGANS (*Lamarck*).

(Plate lxxxix., fig. 1.)

Plumularia elegans, Lamarck, Histoire nat. des Animaux sans Vertèbres, 1816, p. 129.

Aglaophenia elegans, Lamouroux, Hist. polyp. corral. flexibles, 1816, p. 169.

- Aglaophenia avicularis*, Kirchenpauer, Abh. Nat. Ver. Hamburg, v., 1872, p. 33, pls. i. and iii., fig. 3.
- Halicornopsis avicularis*, Bale, Journ. Micro. Soc. Vict., ii., 1881, p. 14, pl. xiii., fig. 3. *Id.*, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 185, pl. x., figs. 1, 2, pl. xix., fig. 32. *Id.*, Bale, Trans. Roy. Soc. Vict., xxii., 1886, p. 101 (reprint p. 29). *Id.*, Marktanner-Turneretscher, Ann. K.K. Hofmus. Wien, v., p. 279.
- Azygoplou rostratum*, Allman, Rep. Sci. Results "Challenger" Exped., Zool., vii., 1883, p. 54, pl. xix., figs. 1-3.
- Halicornopsis elegans*, Billard, Ann. sci. nat., Zool. (9), v., 1907, p. 323. *Id.*, Billard, *Ibid.* (9), ix., 1909, p. 329.

Stations 36 and 48.

From a solitary locality come a few unfasciated fragments of a specimen belonging to this, when fully developed, fasciated species (*cf.* Kirchenpauer 1872, Bale 1886). While the descriptions of Allman (1883) and Bale (1884), with their accompanying characteristic figures, give account of the more salient features of the species—Allman's figure of a colony portraying with exactitude the very irregular mode of branching in our specimens—a few details have to be added.

A branch is set on a stout process which projects from the proximal end of an internode of the parent shoot, and which bears a whorl of three sarcothecæ near its distal end. The first branch-internode is longer than the remainder, and bears a single longitudinal series of four or five sarcothecæ on its adcauline surface, and a single hydroclade near its distal end. The remainder of the internodes are uniform, bearing two alternate hydroclades (occasionally only one), the proximal adcauline, the distal almost on the anterior surface of the internode. The base of each hydroclade is accompanied by three (not two, as Bale states, 1884, p. 186) sarcothecæ; two small scoop-shaped individuals, one on the anterior proximal portion of the basal process, the other on the internode, anterior and distal to the basal process; and the third, a larger canaliculate individual in the distal angle between hydroclade and branch (see Pl. lxxxviii., fig. 1). On long internodes, additional sarcothecæ may appear in the spaces between or beyond the hydroclades.

The structure of the hydrotheca is even more bizarre than authors have recorded. Although the cœnosarc of the specimens is in a very poor state of preservation, it was observed that the position of the hydranth in the hydrotheca is peculiar. The cœnosarc, instead of entering the hydrotheca at the base, proceeds

rhizoidal tubes at base. The characters agree in detail with Bale's descriptions except that the few branchlets present show no sign of incurving towards each other at the tips.

As the following measurements show, there is a considerable amount of variation in the length of the free portion of the mesial sarcothecæ, these structures in general presenting a series which gradually increases in length from the proximal portion of a hydroclade towards its tip. In one case there was no terminal perforation in the mesial sarcotheca of a proximal hydrotheca. No gonosome was observed.

Dimensions.—

Hydroclade-bearing internode, length	0.74 0.78 mm.
" " diameter	0.49-0.56 "
Hydroclade internode, length.....	0.33-0.36 "
" " diameter.....	0.21-0.25 "
Hydrotheca, depth ⁴⁷	0.21 "
" breadth ⁴⁸	0.18-0.20 "
" length of free portion of mesial sarcotheca	0.05-0.13 "

Localities.—Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898; one unbranched colony, 9 cm. high. Station 48, off Wollongong, seven to eight miles from shore; depth, 55 to 56 fathoms; bottom, sand and mud to rock; 18th March, 1898; two fragmentary branched colonies. Southern coast New South Wales; two colonies.

The specimens from Station 48 were at first sight indistinguishable from a colony of *Halicornaria thetidis*, along with which they were growing.

HALICORNARIA PROLIFERA (*Bale*).

(Plate lxxxv., figs. 2, 3.)

Aglaophenia prolifera, Bale, Journ. Micro. Soc. Vict., ii, 1882, p. 34, pl. xiv., fig. 5.

Halicornaria prolifera, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 183, pl. xiv., fig. 1, pl. xvi., fig. 10.

I regard as belonging to a variety of *Halicornaria prolifera* three monosiphonic, unbranched, simply pinnate colonies, the largest 17 cm. in height, which were associated with *Halicornaria furcata*. In the following points they differ from the specimens

⁴⁷ Measured from aperture to base along long axis of hydrotheca.

⁴⁸ At right angles to depth.

described by Bale (1884). The colonies are unbranched. The hydroclades, two on an internode, are sub-opposite, and arise from opposite sides of the internodes, so that they lie in one plane. The hydrothecæ are deeper, their long axis is more nearly parallel to that of the internode, and the aperture, therefore, faces more directly upwards. There is much variation in the prominence of the marginal teeth, which are in some cases almost obsolete, and which are never so prominent in anterior view as are those portrayed in Bale's figure (1884, pl. xvi., fig. 10). The margin, from the anterior aspect, seems to be almost circular. The mesial sarcothecæ are much shorter than those described by Bale, some failing to outreach the anterior hydrothecal tooth, although some, for there is much variation, overtop it for a considerable distance. In this character, our specimens appear to resemble those originally described by Bale (1882, see 1884, p. 184).

In other respects the specimens agree with Bale's description. I would add that on the first hydrotheca of each hydroclade, the mesial sarcotheca is distinctive, for it usually terminates, short of the margin of the hydrotheca, in a broad free lip which lies parallel to the anterior wall of the hydrotheca—the elemental type of sarcotheca from which, as can be seen in these specimens, tubular mesial sarcothecæ and tubular supracalcine sarcothecæ have developed.

Dimensions.—

Stem internode, length	0·57-0·60 mm.
" " diameter	0·45-0·54 "
Hydroclade internode, length.....	0·26-0·31 "
" " diameter.....	0·14-0·18 "
Hydrotheca, depth	0·21-0·22 "
" breadth at mouth (lateral aspect)...	0·16 "
" length of free portion of mesial sarcotheca	0·05-0·13 "
Cauline sarcotheca, greatest width	0·11 "

Locality.—Southern coast of New South Wales.

The species is confined to the waters of South and East Australia.

HALICORNARIA THETIDIS,⁴⁹ *sp. nov.*

(Plate lxxxv., fig. 1; Plate lxxxix., figs. 3, 4.)

Stations 44 and 48.

Trophosome.—Two simply pinnate, unbranched, unfascicled colonies, the largest of which is 18 cm. high, were found at

⁴⁹ Named in honour of H.M.C.S. "Thetis."

Station 48. The stem is divided into internodes which fall roughly into two size-groups—those on the lower part of the stem which bear two hydroclades, and those on the distal part which, as a rule, bear only a single hydroclade each, and are about half the length of the former. The hydroclades are alternate, and are set on the anterior of the stem. They are divided into a series of regular internodes, each of which bears a solitary hydrotheca; but there are no internodal septa.

The hydrothecæ are set closely, but clear of each other. They are deep, oval in shape, and narrowing towards the base, the axis of the hydrotheca lying away from the hydroclade at an angle of about 40°. The margin is scalloped into seven very distinct teeth, of which the anterior is strongly developed and is recurved; while of the three which occur on each side, the abcauline two are bent outwards. The back is entire and free, almost on a level with the posterior teeth. There is no intrathecal ridge, but the aperture between the hydrotheca and the internode is guarded in front and in rear by a row of sharp denticles projecting into the hydrotheca. The median sarcotheca is adnate to the hydrotheca up to the base of the recurved anterior tooth, and thence curves upwards as a free tapering tube, which reaches half the height of the hydrotheca above the hydrothecal margin. It has two openings—a large aperture faces the hydrotheca, and the margin of the terminal opening is serrated as if it had been broken. The lateral sarcothecæ are adnate, saccate, roughly triangular in outline, with a broad free margin which never becomes tubular at the ends. Parallel to the margin, and a short distance within it, runs a chitinous ridge. There are three cauline sarcothecæ, which are large, and are similar to the laterals in shape. One, the smallest, lies at the anterior proximal end of the internode process, the others are distal—one on the anterior, and the other on the posterior of the internode. The distal anterior sarcothecæ of all the internodes lie almost in a straight line along the stem. *Gonosome*.—Unknown.

Dimensions.—

Stem internode, length	0.42-0.88 mm.
" " diameter	0.52-0.67 "
Hydroclade internode, length.....	0.35-0.39 "
Hydrotheca, depth	0.31-0.34 "
" breadth at mouth (lateral aspect)...	0.21-0.22 "
" length of free portion of mesial sarcotheca	0.12-0.21 "
Cauline sarcotheca, greatest width...	0.19-0.22 "

This species most nearly approaches *Halicornaria prolifera*, from which it differs in the arrangement of its hydroclades

distinctly on the anterior of the stem, often only one on an internode. For the sake of comparison, the conditions of a hundred internodes of the two species were examined. In *Halicornaria prolifera*, as represented in this collection of one hundred internodes, ninety-nine bore a pair of hydroclades, one bore a solitary hydroclade; whereas in this species, reckoning from the distal end of the colony, two had three hydroclades, thirty-four a pair, while sixty-four had only a single individual. It also differs in the angle of its hydrotheca, and especially in the open non-tubular condition of its lateral sarcothecæ, and the similar condition, size, and relative position of the cauline sarcothecæ. The dimensions of the present species throughout are much larger.

Localities.—Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898; fragment. Station 48, off Wollongong, seven to eight miles from shore; depth, 55 to 56 fathoms; bottom, sand and mud to rock; 18th March, 1898; two colonies.

Type Specimens.—In the Australian Museum, Sydney.

CLADOCARPUS (?) BATHYZONATUS,⁵⁰ *sp. nov.*

(Plate lxxxix., figs. 2, 6-11.)

Station 57.

Only two colonies of this species were found associated with *Sertulariella longitheca*.

Trophosome.—The habit of a colony is slight, for it consists of an unbranched slender stem up to 20 mm. in height, from the distal portion of which a few short, delicate hydroclades project. The stem is fascicled, the cladate tube being accompanied by a very few accessory tubes for the greater portion of its length, all the tubes forming, with their branches, a tangle of hydrorhiza at the base. None of the fascicle shows a trace of nodes, but the lower portion of the cladate tube, which for from 6 to 12 mm. is destitute of hydroclades, is furnished with a linear series of nematophores, twelve to fourteen in number. The distal portion bears short alternate hydroclades, those on the same side being separated by about 1 mm. Associated with the short projection from the internode, on which the hydroclades rest, is only one nematophore, which lies in the axil between its upper side and the stem; but in addition to this there occur on the anterior of the stem between two hydroclades, one, or more usually, two, cauline nematophores. The sarcothecæ of those nematophores

⁵⁰ βᾶθύζωνος, long-waisted.

are all similar, somewhat rectangular in shape, the upper corners of the rectangle being, as it were, clipped off so that the sarco-styles may issue by a pair of apertures. The hydroclades are divided into long regular internodes not more than seven in number, the greater part of each of which is occupied by a hydrotheca. The lower portion of an internode slightly over-arches the hydrotheca of the preceding one, and the whole cavity is divided by very numerous (eleven to thirteen) septal ridges, two of which lie proximal to the hydrotheca.

The hydrothecæ are tubular, extremely deep and narrow, about four times as long as wide, approaching in this respect the bizarre *Cladocarpis tenuis*, Clarke. Their anterior profile is somewhat S-shaped, narrower at the middle, a long inward curve dividing the hydrotheca into two portions, and giving rise to the specific name signifying "long-waisted." The margin of the hydrotheca is horizontal and is furnished with a single, anterior, flame-shaped tooth, the remainder being very minutely and irregularly crenate. Across the base of the hydrotheca, stretching from the lower end of the posterior wall to a minute knob of chitin on the anterior wall is a chitinous septum perforated to allow the passage of the cœnosarc which connects the hydranth with the common cœnosarc of the colony. On the hydrothecal side this opening is guided by an offshoot of the basal septum which forms a short tongue of chitin bending over it, and resembles a diminutive intrathecal ledge (Pl. lxxxix., fig. 7).

The sarcothecæ are characteristic when mature. The supracalcine are large, and for almost half their height overtop the margin of the hydrotheca. In all cases, they possess two apertures, one terminal, the other latero-adcauline (Pl. lxxxix., fig. 7). Frequently, however, the terminal aperture has lost its general circular shape, and has become elongated, exactly resembling that of the sarcothecæ of *Cladocarpus distomus*, Clarke.⁵¹

This transverse slit-like opening advances a stage further by the growth of its bordering walls, and by the consequent narrowing of the middle portion of the slit. The approaching walls eventually meet, and the slit is divided into two distinct apertures. Where such a process has occurred, the supracalcine sarcotheca has three apertures, but occasionally one of the terminal openings again seems to elongate and become divided, so that four (three of them "terminal") are sometimes present (Pl. lxxxix., fig. 7, lower hydrotheca). Only one of the apertures

⁵¹ S. F. Clarke—Reports of the Sci. Res. Exped. to Eastern Tropical Pacific by "Albatross," viii., The Hydroids—Mem. Mus. Comp. Zool. Harvard, xxxv., No. 1, 1907, p. 17, pl. xiv., figs. 6, 7, and 10.

is strictly terminal, the remainder lying on the exterior ridge of the sarcotheca, and being directed backwards.

A similar development occurs in the median sarcotheca, which is short and stout, projecting outwards and upwards parallel to the hydrotheca wall, from which it is altogether free. In its simplest form, it possesses two openings, one terminal, the other at its base facing towards the hydrotheca. But the terminal opening may become slit-like, and, by the median closing of the slit, two apertures may be formed. These, developing become quite distinct, and the median sarcotheca appears to be bifurcated (Pl. lxxxix. figs. 8, 9, 10, 11). The abcauline wall of the hydrotheca is continued half-way across the base of the mesial sarcotheca as an S-shaped process. The cauline sarcothecæ have already been described. *Gonosome*.—Unknown.

Dimensions.—

Stem, cladate tube, diameter	0.087-0.099 mm.
Hydroclade, internode, length	0.73-0.78 "
Hydrotheca, depth	0.52-0.57 "
" diameter at "waist," side view	0.14 "
" diameter at mouth, side view.....	0.21 "
" diameter at "waist," front view	0.10-0.11 "
" diameter at mouth, front view ...	0.21 "

Affinities.—Owing to the absence of the gonosome, I am unable to give this species its definite generic rank. Its relationships are, however, apparently with those elongated, multiseptate species of *Cladocarpus* and *Aglaophenopsis* which have hitherto been found only in American waters. It approaches *Cladocarpus tenuis*, Clarke,⁵² differing at least in the structure of its sarcothecæ, the robustness and proximity of its hydrothecæ, in the more definite arrangement of the internodal septa, in the absence of nodes in the stem, and possibly in having its stem fascicled. There seems to me also to be a close relationship between this species and *Cladocarpus distomus*, Clarke, from the Eastern Pacific, near Panama, in spite of the fact that no internodal septa occur in the latter and that an additional nematophore is present on each internode.

It is interesting to note that Plumularians of this elongated type have hitherto been found only in American waters.

Locality.—Station 57, off Wata Mooli, three and a half to four miles from shore; depth, 59 to 54 fathoms; bottom, mud; 22nd March, 1898.

Type Specimens.—In the Australian Museum, Sydney.

⁵² S. F. Clarke—Reports on the Dredging Operations of the "Blake"—Hydroida: Bull. Mus. Comp. Zool. Harvard, v., p. 247, pl. v., figs. 31, 31b.

AGLAOPHENIA CRUCIALIS, *Lamouroux*.

(Plate lxxxvi., fig. 1.)

Aglaophenia crucialis, Lamouroux, Hist. polyp. corral. flexibles, 1816, p. 169. *Id.*, Kirchenpauer, Abh. Ver. Hamburg, v., 1872, p. 26 (but not pl. i., fig. 8). *Id.*, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 168 (but not pl. xviii., fig. 8). *Id.*, Billard,⁽¹⁾ Comptes Rendu Acad. Sci., cxlviii., 1909, p. 1063. *Id.*, Billard,⁽²⁾ Ann. Sci. Nat., Zool. (9), ix., 1909, p. 331.

Anisocalyx crucialis, Costa, Fauna del regno di Napoli. Zoofiti Napoli, 1838, p. 19.

Plumularia crucialis, Blainville, Man. d'actinol. ou de zoophytol., 1834, p. 478.

Aglaophenia macrocarpa, Bale, Proc. Linn. Soc. N. S. Wales (2), iii., 1888, p. 791, pl. xxi., figs. 3, 4.

(Not *Thecocarpus crucialis*, Billard, Ann. Sci. Nat., Zool. (9), v., 1907, p. 328, fig. 3).

Stations 44, 47, 48, and 55.

Trophosome.—The general habit of this species being little known, owing to the deficient descriptions of earlier writers, the fragmentary nature of Bale's (1888) specimens, and the young state of the colony, a pencil drawing of which, by Lamouroux, has been recently described by Billard, 1909⁽²⁾, I give a description of a fine colony collected by the "Thetis." This colony, which is 24 cm. high, consists of a main stem, 4 mm. in diameter at the base, expanding downwards into a contorted root-mass, 3 cm. long. The lower portion of the stem is destitute of hydroclades and is covered by extraneous growths, but at 7 cm. from the base of the stem branching begins. The primary branches are set in opposite pairs on the anterior of the stem from which they project almost at right angles. Each lateral series lies by itself in a single plane; but this is not the case with the two series, for the tips of the branches are always inclined towards the anterior, although in such a way that the planes containing the respective series meet at a wide angle. There are seven pairs of primary branches, the largest of which has a diameter at the base of 1 mm. and a length of 82 mm. Such a branch may bear secondary branches up to 47 mm. long, and this again, branches of third degree, 17 mm. long. The distance between primary pairs of branches varies from 15 to 24 mm., that between secondary pairs is about 15 mm. Remarkably fine as this colony is, its size could have been nothing to that of one represented by

a fragment from Station 47. Only 11 cm. of the stem remains, but its basal diameter is 9.5 mm.; of its two primary branches the only complete one is 300 mm. long, while a secondary branch is 125 mm.

There is little to be added to Bale's (1888) excellent description of the minute characters of the trophosome. The branches arise from the hydrocladiate tube of the colony, which is anterior, and have several simple internodes with solitary hydrothecæ, before a hydroclade-bearing internode is reached. In the hydrotheca itself there occurs an undescribed knot of chitin, varying considerably in prominence as seen in lateral aspect, which juts into the hydrotheca cavity from the abcauline wall, very near to the bottom of the cup. The margin of the hydrotheca varies considerably, the characteristic broad lateral lobe especially exhibiting stages of decrease in size, so that in some specimens it has become almost obsolete.

Gonosome.—The corbulæ are of great length, up to 10 mm., and a little over 1 mm. in diameter. Those which I have seen are closed, except for a space between the bases of the leaflets such as Bale has described. Here, however, the margins of the leaflets frequently rise into very pronounced crests, bordered on the outer edge by about ten sarcothecæ, and rising so far above the body of the corbula that the inner edge also becomes free and is supplied with three or four sarcothecæ. The short lateral spur which projects outwards and forwards from the stalk of each leaflet is also better developed, for here it has become an accessory leaflet armed with up to seven sarcothecæ. The general structure of the body of the corbula is that of a cylinder encased within a cylinder, the inner cavity containing the reproductive bodies, the space between the two cylinders (formed of the two walls of the corbula leaflets), containing cœnosarc which is in free communication with the exterior through the sarcothecæ.

Dimensions.—

Organs.	Typical form.	Variety from Station 55.
Hydroclade-bearing internode, length	0.36 mm.	0.25-0.32 mm.
" " diameter	0.29 "	0.38-0.42 "
Hydrothecate internode, length.....	0.32-0.41 mm.	0.31-0.34 "
Hydrotheca, depth	0.27-0.34 "	0.29-0.31 "
" diameter at mouth.....	0.18 "	0.21 "
Hydroclade, length	up to 13 "	up to 13 "
Corbula, length	up to 10 "	?
" diameter	about 1 "	?

A variety occurs at Station 55 in which the hydroclades are more closely set; the hydroclade internodes, and therefore the

hydrothecæ, are more dumpy; the anterior tooth is broader and more strongly developed, and the supracalycine sarcothecæ have frequently a very wide aperture (see table of dimensions).

Remarks.—The synonymy of this species, confounded from early times by erroneous identification with *Plumularia brachiata*, Lamarck, has been elucidated by the recent examination of the type specimens of these two species, undertaken by Dr. Billard. This makes necessary the disappearance of Bale's *Aglaophenia macrocarpa* which is a synonym.

Localities.—Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898; small fragment of colony. Station 47, off Bulgo, six to eight and a half miles from shore; depth, 63 to 57 fathoms; bottom, mud and abattoir refuse; 16th March, 1898; fragment of very large colony. Station 48, off Wollongong, seven to eight miles from shore; depth, 55 to 56 fathoms; bottom, sand and mud to rock; 18th March, 1898; many fragments, with corbulæ. Station 55, off Crookhaven River, one mile from shore; depth, 15 to 11 fathoms; bottom, sand to rock; 20th March, 1898; fragment. Southern Coast, N. S. Wales; one fine colony.

Aglaophenia crucialis has been obtained only from Australian seas, from which indefinite locality Lamarck recorded it. Bale's record is from "off Port Jackson" (1888, p. 792).

AGLAOPHENIA DIVARICATA (*Busk*).

Plumularia divaricata, Busk, Voy. "Rattlesnake," i., 1852, p. 398.

Plumularia ramosa, Busk, *Op. cit.*, p. 398.

Aglaophenia ramosa, Kirchenpauer, Abh. ver. Hamburg, v., 1872, p. 38, pls. i. and ii., fig. 17.

Aglaophenia McCoyi, Bale, Journ. Micro. Soc. Vict., ii., 1882, p. 36, pl. xiv., fig. 2.

Lytocarpus ramosus, Allman, Journ. Linn. Soc., Zool., xix., 1886, p. 154, pl. xxv., figs. 1-3.

Aglaophenia divaricata, Kirchenpauer, *Op. cit.*, p. 26. *Id.*, Bale, Cat. Austr. Hydroid Zoophytes, 1884, p. 162, pl. xv., figs. 7, 8, pl. xvii., figs. 6, 7. *Id.*, Billard, Comptes Rendu Acad. Sci., cxlviii., 1909, p. 368.

Station 54.

The collection contains only a young colony, and a fragment of a larger one, neither of which bear corbulæ. Each hydroclade

branch commences with a series of about six athecate internodes, bearing a single median sarcotheca on the anterior surface.

Dr. Billard regards *Aglaophenia acanthocarpa* and *Aglaophenia laxa*, both described by Allman,⁵³ as identical with *Aglaophenia divaricata*. With this opinion I cannot agree; for Allman has described the presence of, and has figured very distinctly "an imperfect septum continuous with the intrathecal ridge, and another oblique septum at the base of the lateral nematophores" (p. 274) in *Aglaophenia acanthocarpa*; and "three distinct diaphragms—one of which is a continuation of the intrathecal ridge, one at the base of the lateral nematophores, and one at the base of the hydrotheca" (p. 276) in *Aglaophenia laxa*. But one of the most characteristic features of *Aglaophenia divaricata*, as portrayed by Bale and as exhibited in the specimens collected by the "Thetis," is the large size of the supracalcine nematophores, which reaching downwards to the middle of the hydrotheca, bring it about that the septum at their base and that opposite the intrathecal ridge are one.

Other features distinctive of this species are the very strong chitinous ledge which projects into the hydrotheca, and on which the more delicate intrathecal ridge rests, and the absence of a bounding wall between the lower half of the hydrotheca and the internode. *Gonosome* not present.

Dimensions.—

Hydroclade-bearing internode, length	0.26-0.31 mm.
" " " diameter	0.22-0.28 "
Hydroclade internode, length.....	0.24-0.26 "
" " diameter.....	0.14-0.15 "
Hydrotheca, depth	0.165 "
" breadth at mouth ⁵⁴	0.15-0.18 "

Locality.—Station 54, within Jervis Bay; depth, 10 to 11 fathoms; bottom, seaweed and sand; 20th March, 1898.

Order STYLASTERINA.

Family STYLASTERIDÆ.

STYLASTER EXIMIUS, *Saville Kent*.

Stylaster elegans, Duchassaing and Michelotti, Suppl. Mem. Coral. des Antilles—Mem. Acad. Sci. Turin (ii.), xxiii., 1864, p. 68, pl. ix., fig. 4. (Name preoccupied, renamed).

⁵³ Allman—Journ. Linn. Soc., Zool., xii., 1876, pp. 274-276, pl. xxiv.

⁵⁴ Distance from posterior wall to anterior tooth.

- Stylaster eximius*, Saville Kent, Proc. Zool. Soc., 1871, p. 278.
Id., Hickson and England, Siboga Expeditie, Mon. viii.,
 1904—The Stylasterina, p. 9, pl. 1, figs. 1-8.
- Stylaster duchassaingi*, Pourtalès, Ill. Cat. Mus. Comp. Zool.
 Harvard, Deep-Sea Corals, 1871, p. 35, pl. vi., figs. 1, 2. *Id.*,
 Mosley, Rep. Sci. Res. "Challenger" Exped., Zool., ii., 1881,
 pp. 81, 87.

Stations 44, 47, and 48.

Several colonies have been referred to this species. The majority occur growing upon the bare horny axis of an Alcyonarian, and are represented only in part. One markedly flabellate colony has a width of as much as 90 mm., while the tallest fragment is 65 mm. high, and has a diameter of 4.5 mm. at the base. The number of dactylozoids in a cyclosystem, judged by the septa, is smaller than in most species of *Stylaster*, varying from eight to eleven or twelve, and rarely to even fourteen. The cyclosystems are in general bilaterally symmetrical, the lower lip bracket-shaped and projecting, the upper with very few septal divisions. They are often almost crescentic in shape, the long axis lying across the direction of the branch. Ampullæ are plentiful in most of the colonies. The colour is a creamy-white, faintly tinged with varying densities of brown. The specimens approach most closely the facies *altus*, Hickson and England.

Note on Synonymy.—The designation *Stylaster elegans*, Duchassaing and Michelotti (1864), having been found to be preoccupied, the species was renamed in 1871, independently by Saville Kent—*S. eximius*—and by Count Pourtalès—*S. duchassaingi*. The proper specific name is dependent upon which of those designations is prior in time of publication. Mosley, in the "Challenger" Reports (1881), adopted the *S. duchassaingi* of Count Pourtalès, while Professor Hickson and Miss England in 1904 followed the *S. eximius* of Kent, placing in brackets after the reference to Kent's paper the date 4th April, 1871, presumably in justification of their change of name. From our point of view, however, this date has no significance, for it records the date only of the reading and not of the publication of Kent's paper. The question of priority seemed, therefore, to be still in abeyance. I have to thank Dr. P. Chalmers Mitchell, Secretary of the Zoological Society of London, and Dr. Samuel Henshaw, Curator of the Museum of Comparative Zoology, Harvard, for information which finally decides this question. According to the former, Kent's paper was published in the "Proceedings of the Zoological Society of London" on 16th August, 1871; according to the latter, that of Pourtalès was published on 30th October, 1871. The species must therefore be known as *Stylaster*

eximius, Kent, of which *S. duchassaingi* must be regarded as a synonym.

Localities.—Station 44, off Coogee, five to six miles from shore; depth, 49 to 50 fathoms; bottom, fine sand; 15th March, 1898. Station 47, off Bulgo, six to eight and a half miles from shore; depth, 63 to 57 fathoms; bottom, mud and abattoir refuse; 16th March, 1898. Station 48, off Wollongong; depth, 55-56 fathoms; bottom, sand and mud. Between Port Jackson and Tuggerah, N. S. Wales.

EXPLANATION OF PLATE LXXXIV.

- Fig. 1.—*Cryptolaria arboriformis*, sp. nov., colony from Station 44, reduced to one-half nat. size.
- Fig. 2.—*Cryptolaria conferta*, var. *australis*, var. nov., flabellate mass, formed of anastomosed colonies, from Station 42, reduced to one-half nat. size.
- Fig. 3.—*Plumularia sulcata*, Lamarck, colony from Station 48, reduced to almost one-half nat. size.



J. RITCHIE, photo.

EXPLANATION OF PLATE LXXXV.

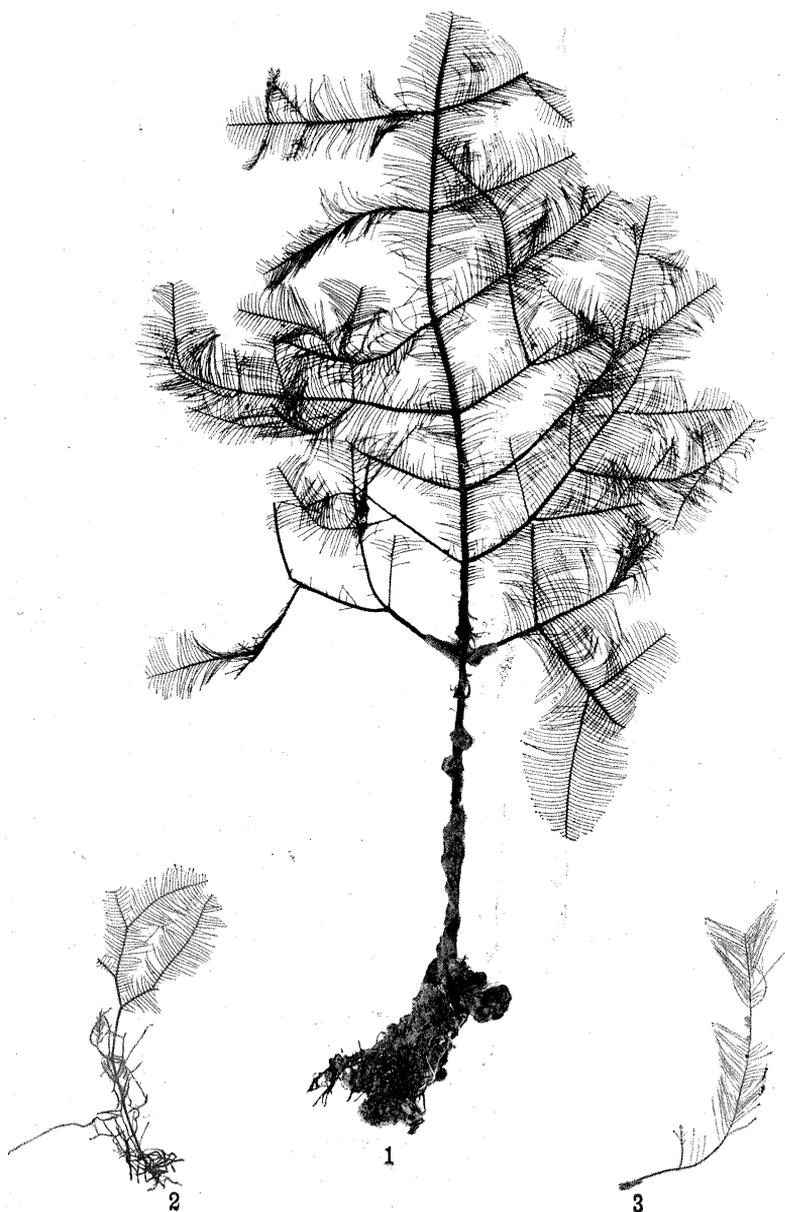
- Fig. 1.—*Halicornaria thetidis*, sp. nov., colony from Station 48 reduced to $\frac{3}{4}$ nat. size.
- Fig. 2.—*Halicornaria prolifera*, Bale, colony from New South Wales, reduced to $\frac{3}{4}$ nat. size.
- Fig. 3.—*Halicornaria prolifera*, Bale, colony from New South Wales, reduced to $\frac{3}{4}$ nat. size.
- Fig. 4.—*Thuiaria sinuosa*, Bale, colonies from Station 54. *St.* = hydroclades modified into stolons from which attendant colonies arise, reduced to almost one-half nat. size.
- Fig. 5.—*Sertularella adpressa*, sp. nov., colonies from Station 54, reduced to almost one-half nat. size.



J. RITCHIE, photo.

EXPLANATION OF PLATE LXXXVI.

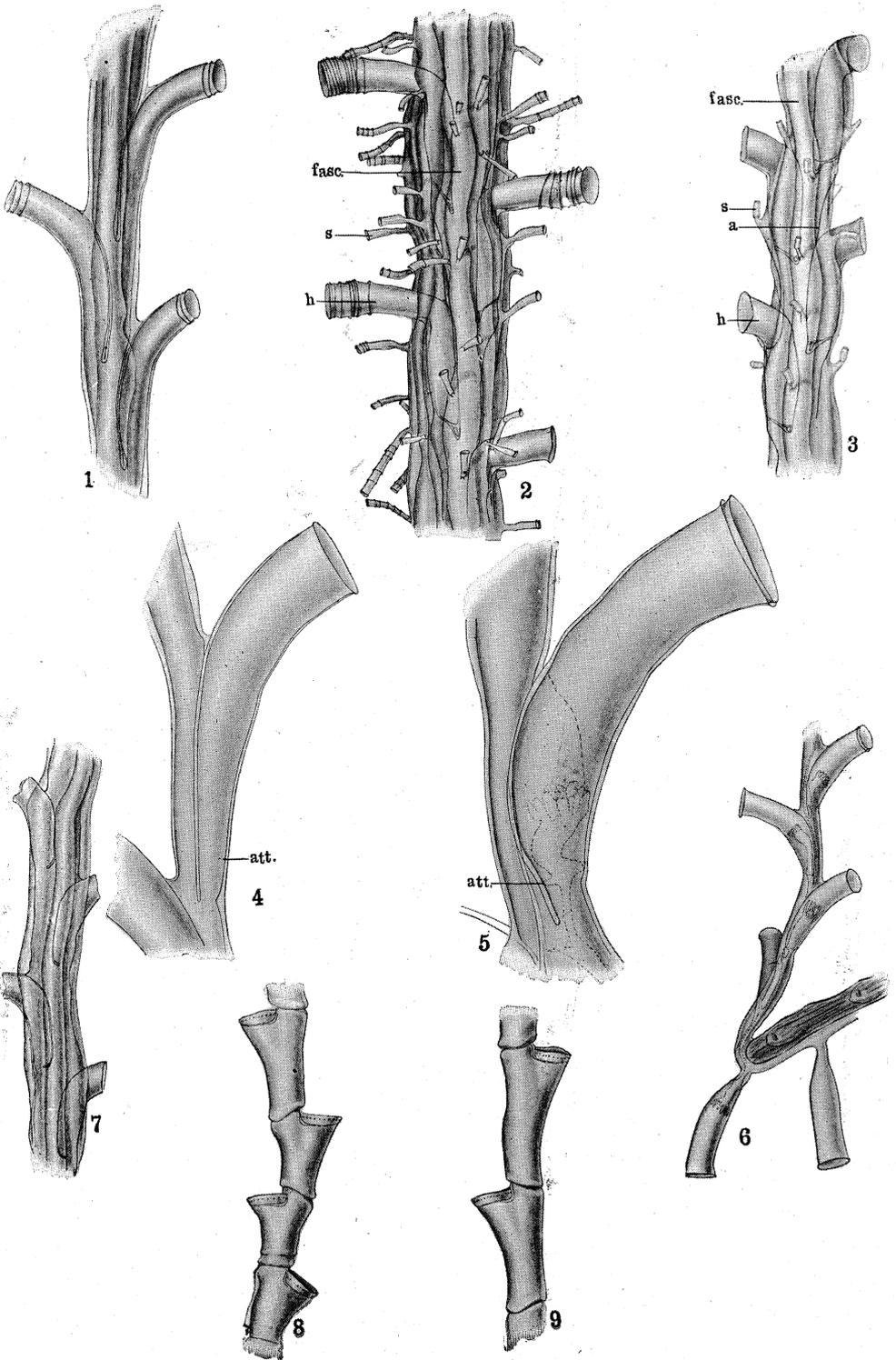
- Fig. 1.—*Aglaophenia crucialis*, Lamouroux, colony from New South Wales, reduced to almost one-half nat. size.
- Fig. 2.—*Halicornaria furcata*, Bale, branched colony from southern coast of New South Wales, reduced to almost one-half nat. size.
- Fig. 3.—*Halicornaria furcata*, Bale, unbranched colony from Station 44, reduced to almost one-half nat. size.



EXPLANATION OF PLATE LXXXVII.

- Fig. 1.—*Cryptolaria conferta*, var. *australis*, var. nov.,⁵⁵ part of slightly fascicled branch with hydrothecæ, Station 42— $\times 40$.
- Fig. 2.—*Perisiphonia pectinata*, Allman, part of fascicled "pinna" of Allman's type specimen, from "Challenger" Station 169, off New Zealand. *Fasc.* = fascicle tube; *h* = hydrotheca with many reduplicated margins, the profile beneath the fascicle tubes faintly outlined; *s* = sarcotheca— $\times 50$.
- Fig. 3.—*Perisiphonia filicula*, Allman, part of fascicled "pinna" Station 57. *a* = outline of axial tube; *fasc.* = fascicle tube; *h* = hydrotheca; *s* = sarcotheca— $\times 50$.
- Fig. 4.—*Cryptolaria crassicaulis*, Allman,⁵⁵ part of branch of Allman's type specimen from "Challenger" Station 344, off Ascension Island, showing hydrotheca. *Att.*, level at which base of polyp was attached to hydrothecal wall— $\times 40$.
- Fig. 5.—*Cryptolaria crassicaulis*, var. *dimorpha*, var. nov.,⁵⁵ part of branch, Station 48, showing hydrotheca. *Att.*, level at which base of polyp is attached to hydrothecal wall— $\times 40$.
- Fig. 6.—*Cryptolaria crassicaulis*, var. *dimorpha*, var. nov., part of colony, Station 48, showing in the lower part, a stolon creeping upon a Polyzoön, and bearing two simple *Laföä*-like hydrothecæ, but afterwards developing into an erect typical *Cryptolaria* colony— $\times 10$.
- Fig. 7.—*Cryptolaria arboriformis*, sp. nov.,⁵⁵ part of fascicled branch with hydrothecæ, Station 44— $\times 40$.
- Fig. 8.—*Halecium sessile*, Norman, Station 54. Parts of branch showing variation in length of internodes— $\times 40$.
- Fig. 9.—*Halecium sessile*, Norman, Station 54. Parts of branch showing variation in length of internodes— $\times 40$.

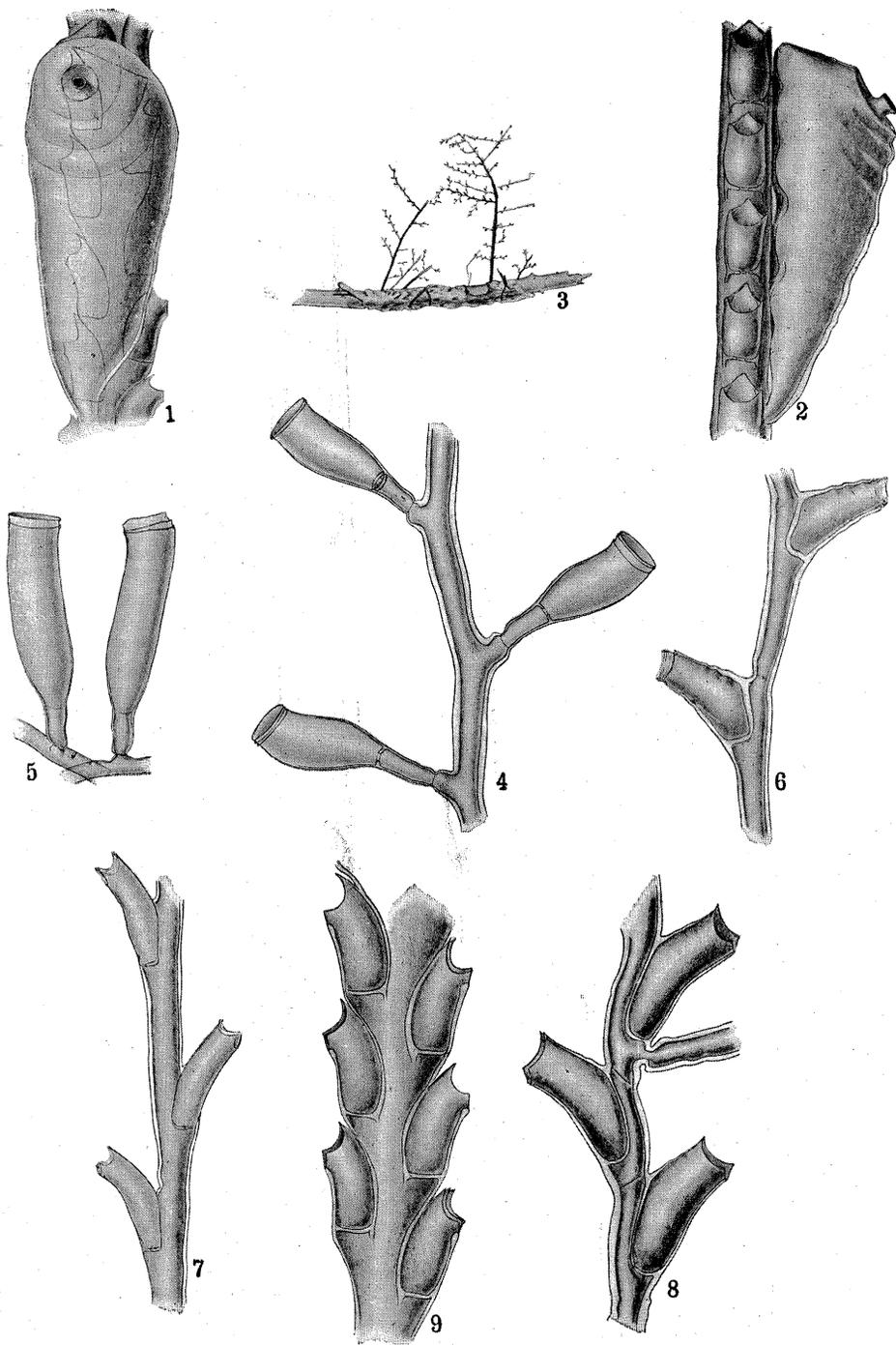
⁵⁵ For the sake of comparison, the figures of the various species of *Cryptolaria* (except Fig. 6) have been drawn with the same magnification.



J. RITCHIE, del.

EXPLANATION OF PLATE LXXXVIII.

- Fig. 1.—*Sertularella adpressa*, sp. nov., part of branch, with gonangium seen from the anterior, Station 54— $\times 50$.
- Fig. 2.—*Sertularella adpressa*, sp. nov., part of branch, with gonangium, seen in lateral aspect, Station 54— $\times 50$.
- Fig. 3.—*Lictorella concinna*, sp. nov., colonies, Station 44—Nat. size.
- Fig. 4.—*Lictorella concinna*, sp. nov., part of branch, with hydrothecæ, Station 44— $\times 55$.
- Fig. 5.—*Lafoëa tenellula*, Allman, sections of stolon, with hydrothecæ, Station 57— $\times 70$.
- Fig. 6.—*Sertularella turgida* (Trask) (?), part of stem with hydrothecæ, Station 57— $\times 24$.
- Fig. 7.—*Sertularella longithecæ*, Bale, *typica*, part of stem with hydrothecæ, Station 57— $\times 24$.
- Fig. 8.—*Sertularella longithecæ*, var. *robusta*, var. nov., part of stem with hydrotheca and base of branch, Station 48— $\times 24$.
- Fig. 9.—*Sertularella adpressa*, sp. nov., part of branch with hydrothecæ, Station 54— $\times 77$.



J. RITCHIE, del.

EXPLANATION OF PLATE LXXXIX.

- Fig. 1.—*Halicornopsis elegans* (Lamarck), hydrotheca. *f* = lateral flaps from internodes, uniting with side of hydrotheca; *s.ap* = median supra-calycine sarcopore behind hydrotheca; *i* = internal thickening of hydrothecal wall; *b.ap* = antero-basal aperture of hydrotheca, through which polyp enters. Station 48— $\times 150$.
- Fig. 2.—*Cladocarpus bathyzonatus*, sp. nov., colony from Station 57—Nat. size.
- Fig. 3.—*Halicornaria thetidis*, sp. nov., portion of hydroclade with hydrothecæ. *h* = hydrotheca; *ss.* = supracalycine sarcotheca; *m.s.* = median sarcotheca— $\times 70$.
- Fig. 4.—*Halicornaria thetidis*, sp. nov., part of stem with bases of two hydroclades, anterior aspect. *h* = hydroclade; *d.c.s.* = distal anterior cauline sarcotheca; *p.c.s.* = proximal anterior cauline sarcotheca; *p.s.* = posterior cauline sarcotheca— $\times 40$.
- Fig. 5.—*Plumularia sulcata*, Lamarck, lower part of hydroclade with hydrotheca, anterior aspect. *i.s.* = internodal sarcotheca; *l.s.s.* = lateral supracalycine sarcotheca; *m.s.s.* = median supracalycine sarcotheca; *h* = hydrotheca; *m.s.* = median sarcotheca. Station 48— $\times 70$.
- Fig. 6.—*Cladocarpus bathyzonatus*, sp. nov., part of hydroclade with hydrothecæ, anterior aspect. *s.s.* = supracalycine sarcotheca; *h* = hydrotheca; *m.s.* = median sarcotheca; *n* = node—the horizontal lines are chitinous thickenings in the internode seen through the hydrotheca. Station 57— $\times 42$.
- Fig. 7.—*Cladocarpus bathyzonatus*, sp. nov., part of hydroclade with hydrothecæ, lateral aspect. *s.s.(1)* = supracalycine sarcotheca with double terminal aperture; *i r.* = diminutive intrathecal ridge in form of a short flap covering opening at base of hydrotheca; *m.s.* = median sarcotheca; *r* = one of the chitinous ridges in the internode; *n* = node; *s.s.(2)* = supracalycine sarcotheca with triple terminal aperture. Station 57— $\times 42$.
- Figs. 8, 9, 10, 11.—*Cladocarpus bathyzonatus*, sp. nov., series showing the development of the median sarcotheca of the hydrotheca. Station 57— $\times 185$.
- 8.—Lateral aspect; simple terminal and basal apertures.
 - 9.—Half-front aspect, terminal aperture elongated.
 - 10.—Half-front aspect; the walls have joined between the extremities of the elongate aperture, and thus two apertures have been formed.
 - 11.—Half-front aspect—each of the two terminal apertures is raised on a short process.

